Project no. 037046

Project acronym: DESIRE

Project title:

Desertification mitigation and remediation of land - a global approach for local solutions -

Sixth Framework Programme
Sub-priority 1.1.6.3 Global change and ecosystems

Period covered: from 1/2/2011 to 31/1/2012
Starting date of the project: Feb. 1st 2007
Project coordinator: Prof. Dr. C.J.Ritsema
Project coordinator organization: ALTERRA, Wageningen UR

Date of preparation: 03/05/2012
Duration: 5 years

Revision: version 2.0

Contents

PART I PROJECT EXECUTION

1 Project overview

Inspired by the desire for effective local implementation of existing and innovative strategies to combat land degradation and desertification, the EU-funded DESIRE project – "Desertification mitigation and remediation of land – A global approach for local solutions" (www.desire-project.eu) – designed, a methodological framework which was applied by DESIRE around the world in close collaboration with local stakeholders. The focus was on finding Sustainable Land Management (SLM) strategies to prevent and combat degradation in a range of dryland areas. Project activities were successfully implemented between 2007 and 2012 and results are being applied in multiple ways.

With more than one third of the world's land area affected, and more than one billion people at risk, combating degradation and desertification is essential to ensure long-term productivity of inhabited drylands. Desertification is generally defined as land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors, including climatic variations and human activities. In this definition, land degradation refers to the loss of the biological or economic productivity of soil and local water resources, land surface and vegetation including crops[1],[2]. Promising SLM strategies exist – but information about them is often not effectively shared. Consequently they remain underutilized, and degradation in drylands continues. The DESIRE project strived to find solutions for these pressing issues.

---

[1] UNEP, 1994. United Nations Convention to Combat Desertification in those countries experiencing serious drought and/or desertification, particularly in Africa., United Nations Environment Programme for the Convention to Combat Desertification (CCD), Interim Secretariat for the CCD, Geneva.

[2] UNEP, 1997. World Atlas of Desertification, 2nd Edition, Middleton N, Thomas DSG (Eds.) Edward Arnold, London, UK, 182


photo by Erik van den Elsen


photo by Erik van den Elsen

Combating desertification is considered essential to ensure the long-term productivity of inhabited drylands. The United Nations Convention to Combat Desertification (UNCCD) highlights the importance of both scientific and community approaches and promotes action to combat desertification. Actions must emphasize popular participation to enable local people and NGOs to reverse land degradation through self-help, in an environment enabled by governments and fully integrated into national policies. What is needed is an approach that combines scientific rigour and accuracy with relevance and sensitivity to local perspectives and context. Conservationists, land managers and local communities need to work together towards shared goals.

Many research projects have made 'scientifically based' recommendations, on ways to combat land degradation, but this output tended to be too fragmented for practical policy-making. Other recent and current projects (e.g. MEDACTION, DESERTLINKS, LADAMER, DESURVEY) have made considerable progress in developing instruments that are of direct use for policy-makers, planners and managers in affected areas. The DESIRE project was therefore able to build on previous work, but added to this by combining local knowledge generated from bottom-up approaches with knowledge gained through more top-down, science-led approaches. By integrating scientific and local knowledge, DESIRE aimed to enable land managers and policy-makers to respond adequately to the challenges of land degradation.

The DESIRE project has resulted in numerous positive outcomes including: measureable SLM benefits at the local level, community collaboration and empowerment, young scientists in the field of SLM, a universally applicable approach for identifying, prioritizing, testing, evaluating and implementing appropriate SLM technologies, and tools to inform decision makers. The DESIRE approach can be applied by agricultural advisors, government institutions, or any project that aims to combat land degradation, locally or regionally. To enable replication, the findings have been widely communicated and are freely available in the multi-lingual web based DESIRE Harmonized Information System (HIS) (www.desire-his.eu).

2 Project objectives

The objectives of the DESIRE project were to:

1. Give SLM measures a sound scientific basis.
2. Improve definition of indicators of land degradation and desertification.
3. Assess and develop promising SLM strategies with stakeholder groups.
4. Evaluate SLM measures at local and regional scales.
5. Disseminate results, guidance and decision support tools in formats suitable for all stakeholders.

The **first objective** of DESIRE was to look at degradation and desertification processes in an integrated way, in order to review the cause and effect links and give conservation measures a sound scientific basis. The **second objective** was to improve definition of suitable indicators for qualitative and quantitative evaluation of the land degradation and desertification status in the selected study regions, while the **third objective** of DESIRE was to assess and develop promising conservation measures using a participatory approach with stakeholder groups. This ensured that these measures are practical, acceptable and affordable by the people who have to implement them, while their effectiveness remains based on solid science. The **fourth objective** of DESIRE was to evaluate mitigation and remediation measures on a larger than local scale, using a set of spatial models and geo-information tools that permit the evaluation of both *on-site* and *off-site* effects at various scales. These models are also capable to estimate the effectiveness of conservation measures given expected future changes in climate of land use. The **fifth objective** of DESIRE was to disseminate the results, guidance and decision support tools in suitable formats for all relevant stakeholders. Although the last objective, special attention was given to it right from the beginning as it is crucial for the transfer and use of the knowledge gained through the course of the project.

3 Project organisation structure

The DESIRE project was structured around 6 Working Blocks, facing the following problems: drought, soil erosion by water, soil erosion by wind, salinization, forest fires, vegetation degradation, and flash floods. In Figure 3-1, the DESIRE project phases, Working Blocks, and main outputs are depicted. Within the DESIRE project, in total 35 Deliverables have been distinguished, some supporting to other, some end products, and some study site specific or more generic in character (for more information, see the Description of Work). DESIRE worked in 16 study areas around the world (Figure 3-2).

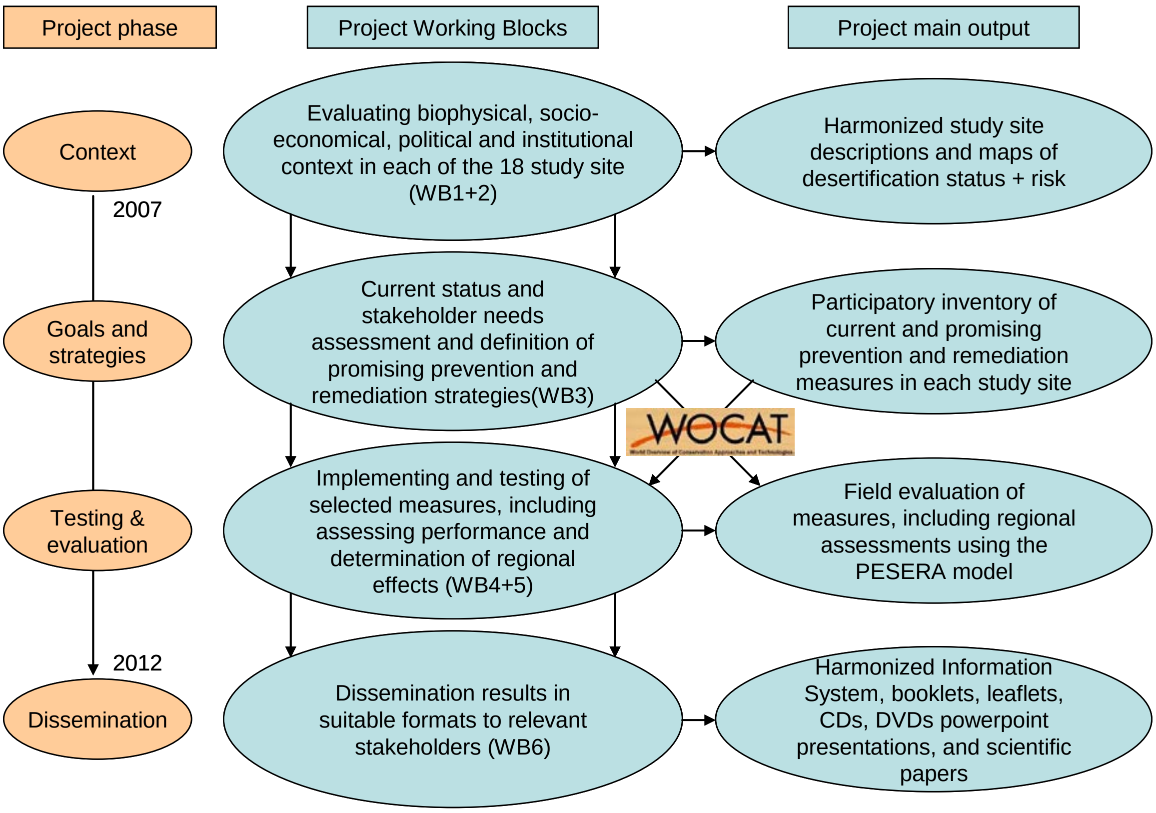


Figure 3-1 DESIRE project phases, Working Blocks and main outputs.

Figure 3-2 DESIRE study sites.

4 Contractors involved

The DESIRE consortium consisted of a balanced group of project partners from governmental, university, research institute, NGOs, SME and community level background (Table 4-1).

Table 4-1 Contractors of the DESIRE IP.

No	Contractor	Country
1	ALTERRA	Netherlands
2	Catholic University of Leuven	Belgium
3	University of Leeds	UK
4	University of Wales Swansea	UK
5	University of Bern, Centre for Development and Environment	Switzerland
6	Estacion Experimental de Zonas Aridas (EEZA)	Spain
7	University of Aveiro	Portugal
8	CNR Research Institute for Hydrogeological Protection	Italy
9	Agricultural University of Athens	Greece
10	Eskisehir Osmangazi University	Turkey
11	University of Mohamed V, Chair UNESCO-GN	Morocco
12	Institut des Regions Arides	Tunisia
13	Institute for Soil and Water Conservation (ISWC)	China
14	ESW, Wageningen University	Netherlands
15	Democritus University of Thrace	Greece
16	Both ENDS	Netherlands
17	International Soil Reference and Information Centre (ISRIC)	Netherlands
18	Escola Superior Agrária de Coimbra	Portugal
19	Centre d'Action et de Realisations Internationals (CARI)	France
20	University of Botswana	Botswana
21	International Institute for Geo-Information Science and Earth Observation (ITC)	Netherlands
22	Institut de Recherche pour le Developpement (IRD)	France
25	Osservatorio Mediterraneo per lo Studio delle Soluzioni dei Problemi Economici della aree a Rischio Desertificazione (MEDES)	Italy
26	Moscow State University of Environmental Engineering	Russia
27	Instituto de Investigaciones Agropecuarias (INIA)	Chile
28	National Institute for Agriculture Research and Development (INIDA)	Cape Verde

5 Methodology and approaches

5.1 The DESIRE Approach: a new formula for programs on Sustainable Land Management

The DESIRE approach to achieve the project objectives comprises five steps (Figure 5-1):

1. Establishing land degradation, defining SLM context and sustainability goals;
2. Identifying, evaluating, and selecting SLM strategies using a participatory learning process and WOCAT tools with local stakeholders;
3. Trialling and monitoring selected strategies;
4. Upscaling strategies to assess larger scale biophysical and socio-economic effects;
5. Disseminating knowledge gathered in previous steps to multiple target audiences.

From start to finish, a fundamental element of the DESIRE approach is broad stakeholder participation.

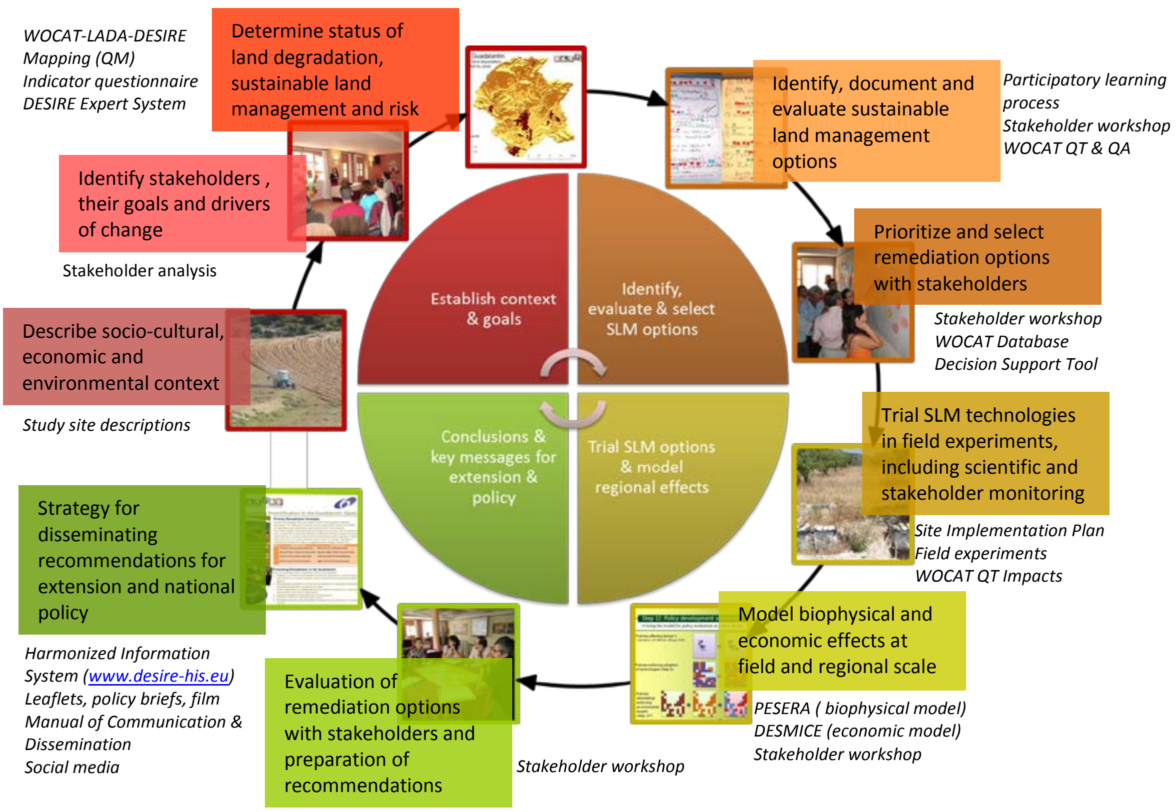


Figure 5-1 The DESIRE Approach.

A major innovation of DESIRE is the coupling with WOCAT (World Overview of Conservation Approaches and Technologies; www.wocat.net), which for 20 years has been establishing tools for documentation, evaluation and dissemination of SLM practices. This innovative, practical approach makes existing - yet underutilized – and new information on SLM more accessible. WOCAT's potential for identifying and sharing knowledge worldwide in a standardized format makes it a cornerstone of the DESIRE approach. Additionally, WOCAT questionnaires facilitated learning and collaboration between stakeholders and SLM specialists.

5.2 Problems and sites addressed

The DESIRE approach was applied in 17 desertification affected areas in 13 countries, representing a wide variety of worldwide degradation problems (Table 5-1). Problems in the study sites included erosion by water, erosion by wind, salinization, vegetation degradation, competition for water, forest fire, drought and flash floods. Other selection criteria included a record of previous research, and the potential for successful implementation of mitigation and preventive strategies.

Table 5-1 Sites and degradation phenomena addressed in the DESIRE project.

Nr	Country	Site	Size (km2)	Land use	Degradation phenomena
1	Spain	Guadalentin (Rambla de Torrealvilla)	250	Arable (irr./non-irr.); forest; orchards	Erosion, Salinisation
2	Portugal	a) Maçao b) Gois	400	Mostly forest; some agriculture	Erosion, Wildfires
3	Italy	Rendina	410	Mainly arable (dry; cereals); Olives; Forest	Erosion, mass movements; sedimentation
4	Greece	Crete	1000	Widespread olives; shrub and bushland; pasture	Soil erosion, soil and water salinization, water stress
5	Greece	Nestos	50	Irrigated agriculture, marshes	Salinisation
6	Turkey	Karapinar	150	Irrigated agriculture	Salinisation, groundwater level
7	Turkey	Eskisehir	90	Dryland /irr. agriculture, pasture	Urbanisation, erosion, droughts
8	Morocco	Mamora/Sehoul	400	Decreasing cork oak, increasing agriculture and grazing	Erosion, biological degradation
9	Tunisia	Zeuss-Koutine	900	Rangeland, agriculture	Biological degradation, erosion by wind and water, drought
10	Russia	Djanybek	12370	Grassland, Artificial forest belts	Salinisation, erosion by wind and water
11	Russia	Novy-Saratov	29000	Irrigated agriculture	Waterlogging, salinisation
12	China	Loess plateau	7680	Arable farming, cash crops, grass planting and vegetables	Water erosion
13	Botswana	Boteti	34960	Mixed land use; grassland savannah	Wind erosion
14	Mexico	Cointzio	650	Cropland, Forest Grassland	Water erosion
15	Chile	Secano Interior	9100	Cereals, Forest plantations	Water erosion
16	Cape Verde	Ribeira Seca	70	Mainly rainfed agric. (82%)	Water erosion, drought

To summarize the actions and achievements of the collaboration, a short review of each step of the DESIRE approach as applied in the DESIRE project is given below with associated outcomes, including some specific examples. Additional information can be found in the supporting annexes and on the DESIRE HIS website (www.desire-his.eu).

PART II WORK PERFORMED AND END RESULTS

6 Establishing land degradation, defining SLM context and sustainability goals

The DESIRE approach begins with gaining a clear picture of the current desertification context and priorities through the following and entails five steps:

1. Selecting study site(s) (see chapter 5.2);
2. Identifying stakeholder priorities;
3. Analysing the desertification context and drivers of change;
4. Determining current land degradation and conservation status using the WOCAT-LADA-DESIRE Mapping tool;
5. Determining future land degradation risk, using a DESIRE developed Expert System requiring only a few indicators per degradation process.

In this phase, a review of existing knowledge on desertification was made to establish the state of the art of knowledge and tools to address desertification. This review was used to inform the development of new knowledge and tools in the DESIRE project.

6.1 Existing knowledge on desertification

Despite extensive research, lack of good information on the extent and severity of land degradation in drylands still hampers attempts to determine its significance. It is generally accepted that a variety of both natural (climate; biophysical characteristics) and human-induced (land use; socio-economic) factors play a role in the occurrence of land degradation[3]. Also, most scientists agree that participation of local stakeholders (e.g. farmers, local government etc.) is of key importance in the development and implementation of possible solutions.

As the concept of desertification is very broad, many environmental problems can be attributed to desertification[4]. Among these, often reported are soil erosion, salinization, the degradation of vegetation as a result of land use change, overgrazing and deforestation, forest fires, flooding, sedimentation and siltation, and the loss of biodiversity. These phenomena are of a biophysical nature, while their causes can be both bio-physical and socio-economic or political (e.g. urbanization, competition for scarce water and unsustainable water management, land abandonment and policies). The DESIRE project made an **information review** of existing knowledge on desertification from published results of former projects and research[5].

[3] E.g. geist and Lambin (2004), Reynolds et al. (2001)
[4] Martinez-Fernandez and Esteve (2005)
[5] The information review is downloadable from the HIS at http://www.desire-his.eu/en/study-site-contexts/wp11-information-review-thematicmenu-165

Mapping, monitoring and modelling: a continued need for improved methods

Mapping desertification and sustainable land management is not only needed for developing a more thorough scientific understanding of the dynamic processes and driving forces behind desertification, it is also an important requirement for the drafting and implementation of remediation options, development plans and policy decisions. Existing maps of desertification often display risk instead of the actual state of desertification[6]. In addition, there is a lack of maps showing socio-economic information on land use and land use practices, and of the efforts done to combat desertification.

As direct monitoring and/or mapping of desertification is rather complicated, desertification is usually assessed by using indicators. Land degradation indicators designed for dryland areas contain simplified, synthetic information on the state and tendency of desertification. Many indicators have been proposed to describe the susceptibility of drylands to desertification[7]. Until now, scientists have not reached consensus about a standard set of indicators to use in monitoring desertification[8].

Because desertification consists of dynamic processes operating at slow and fast rates[9], monitoring and assessing phenomena of land degradation and the evaluation of remediation strategies should be done on both short (several growing seasons) and longer temporal scales (> 10 years). Techniques for this purpose include field experiments, and the collection of stakeholder information of land management practices for the short temporal scale, and remote sensing for long-term assessments[10].

---

[6] E.g. Thomas, 1997; MEA (2005)
[7] E.g. Pinet et al., 2006; and e.g. Tongway and Hindley, 2000, and the MEDALUS, DESERTLINKS (DIS4ME), MedAction and INDEX research projects.
[8] Pinet et al., 2006
[9] Reynolds et al., 2009
[10] E.g. Oldemann et al. (1994); Liniger et al. (2007)

Much work has been done to model the various components and processes of desertification, both socio-economic and biophysical aspects. Expected progress in modelling includes improvements in up- and downscaling, the use of higher quality DEMs, descriptions of desertification processes not yet included in existing models, and better quality parameterisation and validation of models. But the most important demand to the modelling community is to integrate biophysical and socio-economic models in order to estimate both the economic viability and biophysical effects of land degradation, and to simulate scenarios of sustainable land management technologies, policy scenarios and scenarios of environmental change[11].

Many research efforts on desertification, few providing solutions on the ground

Since the launch of the UNCCD, many research projects, programs and networks have addressed desertification in various ways, both policy-and knowledge-oriented. However, few efforts have addressed the development of ready-to-implement remediation strategies founded on sound scientific assessment. DESIRE is one of these.

6.2 Stakeholders and their goals

An inventory was made of relevant stakeholders in the DESIRE study sites with regard to desertification problems. The inventory was based on the study site descriptions, interviews with the coordinators of the research teams in each study area. The inventory was supplemented with information on the composition of stakeholder groups in each study area derived from the stakeholder workshops during the stage of identification, evaluation and selection of SLM strategies (see chapter 7).

[11] Mulligan, 2004

The inventory showed that the main stakeholder groups were part of the main categories civil society, government and administration, the private sector and research and education. The stakeholder groups addressed by the project in most study sites included ministries of agriculture, forestry, environment and planning or subdivisions of these, regional branches of ministries, municipalities, agricultural associations of farmer's unions, land users and research centres and universities (see Figure 6-1).

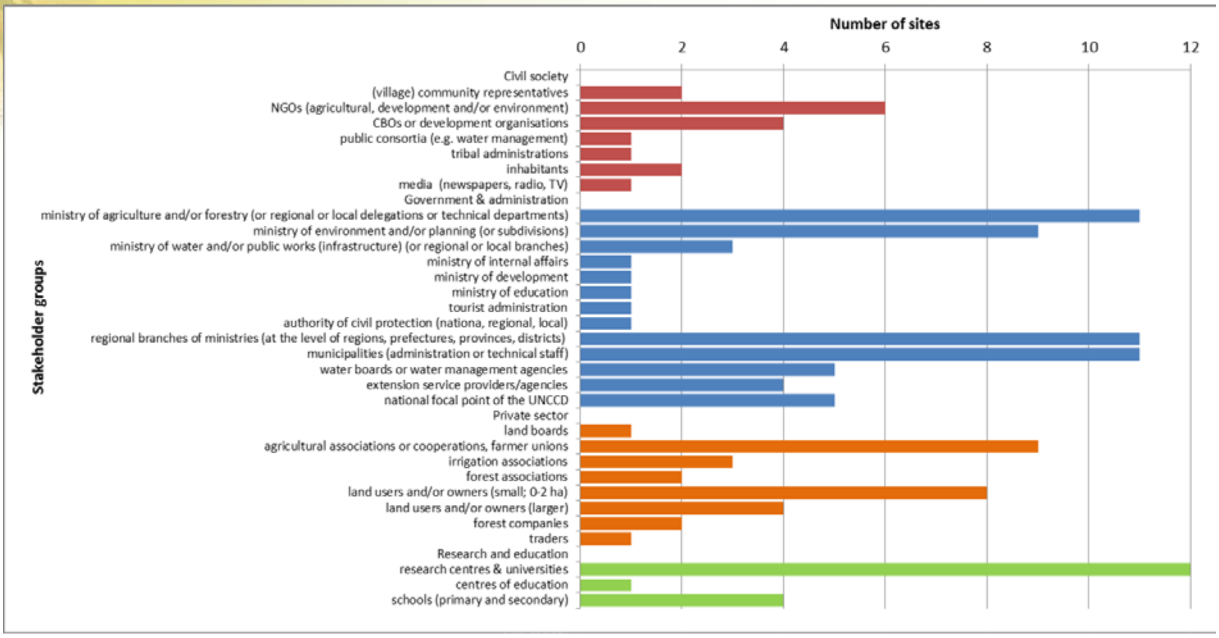


Figure 6-1 Overview of occurrence of relevant stakeholders for sustainable land management in the DESIRE study sites.

The results of the stakeholder inventory helped to identify key players and beneficiaries for the participatory identification, evaluation and selection of SLM strategies in the project (chapter 7), as well as for the feedback on the results of the trialling and upscaling of SLM strategies (chapter 9). A detailed description of stakeholder groups in the DESIRE study sites is available in the **inventory of major stakeholders in the DESIRE study areas**[12]**.**

In order to plan for sustainable land management interventions in a region, the interests in sustainable development (or sustainability goals) from the stakeholders in the region should be known. These can be of three main types[13]:

- *Efficiency:* aiming for an affordable, more efficient and secure agricultural production,
- *Equity:* aiming for human and animal well-being, or equal sharing of benefits from natural resources,
- *Environmental sustainability:* aiming at reducing negative impacts of land and water use on the environment

The sustainable development goals of the stakeholder groups in the DESIRE study sites were inventoried by the research teams in the study sites based on a questionnaire and documentation from policy frameworks. Most goals were of the type 'environmental sustainability' (Figure 6-2), reflecting the objectives of the stakeholder communities to reduce negative impacts of desertification on ecosystem services in the study sites. An example of sustainable development targets is given for the study site in Italy in Table 6-1.

---

[12] Deliverable 1.4.1; downloadable from the HIS at http://www.desire-his.eu/en/study-site-contexts/wp14-stakeholders-a-sustainability-thematicmenu-168.

[13] Hein (2010).

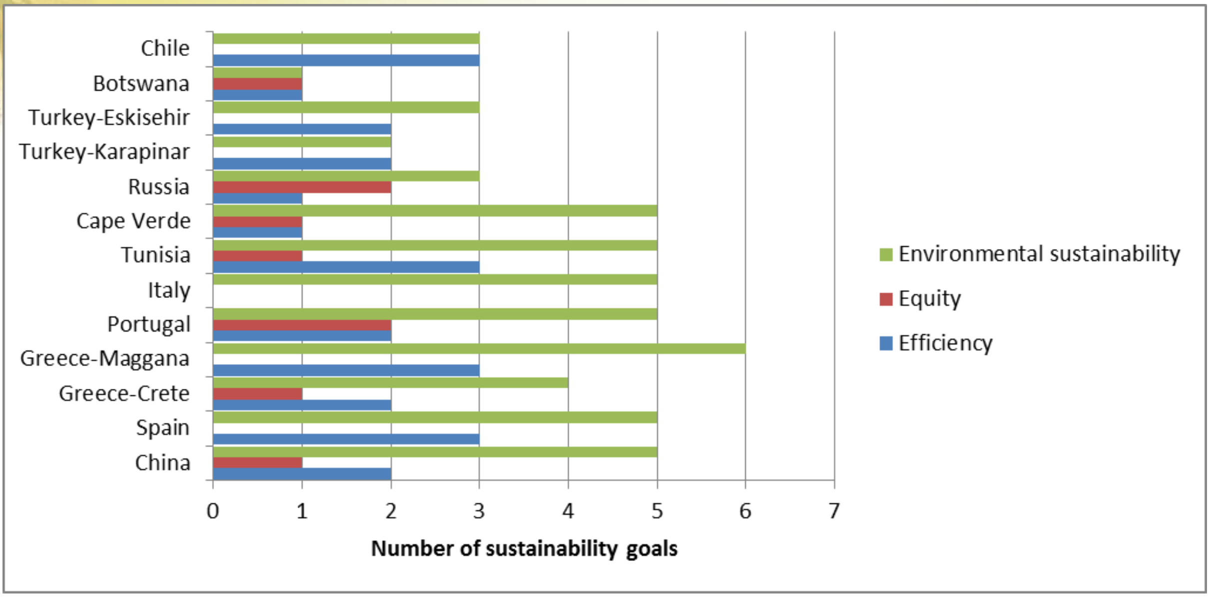


Figure 6-2 Main categories of sustainability goals in several DESIRE study sites.

Table 6-1 Sustainability goals of stakeholders in the Rendina Basin, Italy.

Sustainability Goals	
Goal 1	Conservation and maintenance of soil and water resources
Goal 2	Maintenance of forest ecosystem and vitality with special regards to functionality to preserve groundwater recharge and water quality
Goal 3	Maintenance of ecosystem through guided adaptation to climatic changes
Goal 4	Suggest improvement and adaptation of current policy and legal tools in order to tackle future trends involving soil and water conservation
Goal 5	Suggest solution to present contradictions in soil conservation regional policies

Within DESIRE, the sustainability goals were used in the participatory identification and selection of SLM strategies in the project (chapter 7). The sustainability goals also served to guide the technology, policy and global scenarios in the upscaling of SLM strategies (chapter 9). An overview of **sustainability goals of stakeholders in the study sites** is available on the DESIRE-HIS[14].

[14] Deliverable 1.4.2; http://www.desire-his.eu/en/study-site-contexts/wp14-stakeholders-a-sustainability-thematicmenu-168/781-sustainability-goals-of-stakeholders-in-study-sites

6.3 The desertification context of the study areas and drivers of change

DESIRE focused its research on areas in sub-humid to semi-arid climatic zones. The major land use in the sites includes arable cropping (both irrigated and rainfed), grazing land, horticulture, forestry or tree crops. Many current land management practices are well established, traditional systems that have proved to work under the prevailing conditions. However, these are under increasing pressure by population growth, migration, market pressures, urbanisation, and both agricultural intensification (e.g. overgrazing) and extensification (e.g. land abandonment). The degradation problems experienced in the areas are soil erosion (caused by wind and water), salinisation, vegetation degradation and wild fires. Conservation measures are applied in many of the sites and range from capital-intensive structural measures (e.g. terracing, water management structures) to low-cost simple practices, such as contour ploughing or fencing.

Many sites (11) are characterized by an ageing population due to the ex-migration of younger people. In some areas this goes along with land abandonment, leading to land degradation due to the lack of maintenance of SLM measures. More dependency on off-farm income also leads to lower investments in agriculture and sustainable land management. Land fragmentation is a problem in several sites (6), leading to increased land abandonment, less managed forest and vegetation, and less land care in general. This in turn is a cause of increased risk of forest fires, lowered production and incomes, soil erosion and nutrient depletion. In most study sites environmental legislation and policy exists, but the enforcement is weak. In the sites located in the EU, the Common Agricultural Policy was reported to have positive impacts on SLM, but also promoted the cultivation of unsuitable land. A lack of cross-sectoral planning and collaboration is a common problem to all study sites. Inadequate extension services and a low accountability of governmental institutions were reported for several sites.

The economic, environmental and socio-cultural context of the DESIRE study sites have been documented in detail in **a compilation and synthesis of study site descriptions**[15].

Drivers of change

Land degradation in dryland areas is subject to bio-physical drivers of change (e.g. climate change) and socio-economic drivers of change (e.g. market developments), and most often by a combination of these, through land use and management. DESIRE developed a conceptual framework to interrelate desertification processes with their biophysical and socio-economic drivers, the acting stakeholders in the study areas, and their response to desertification in terms of sustainable land management strategies and land use and management (Figure 6-3). The main drivers of desertification were identified for each study site, as well as the relevant policies targeted to respond to desertification, or other policies impacting desertification.

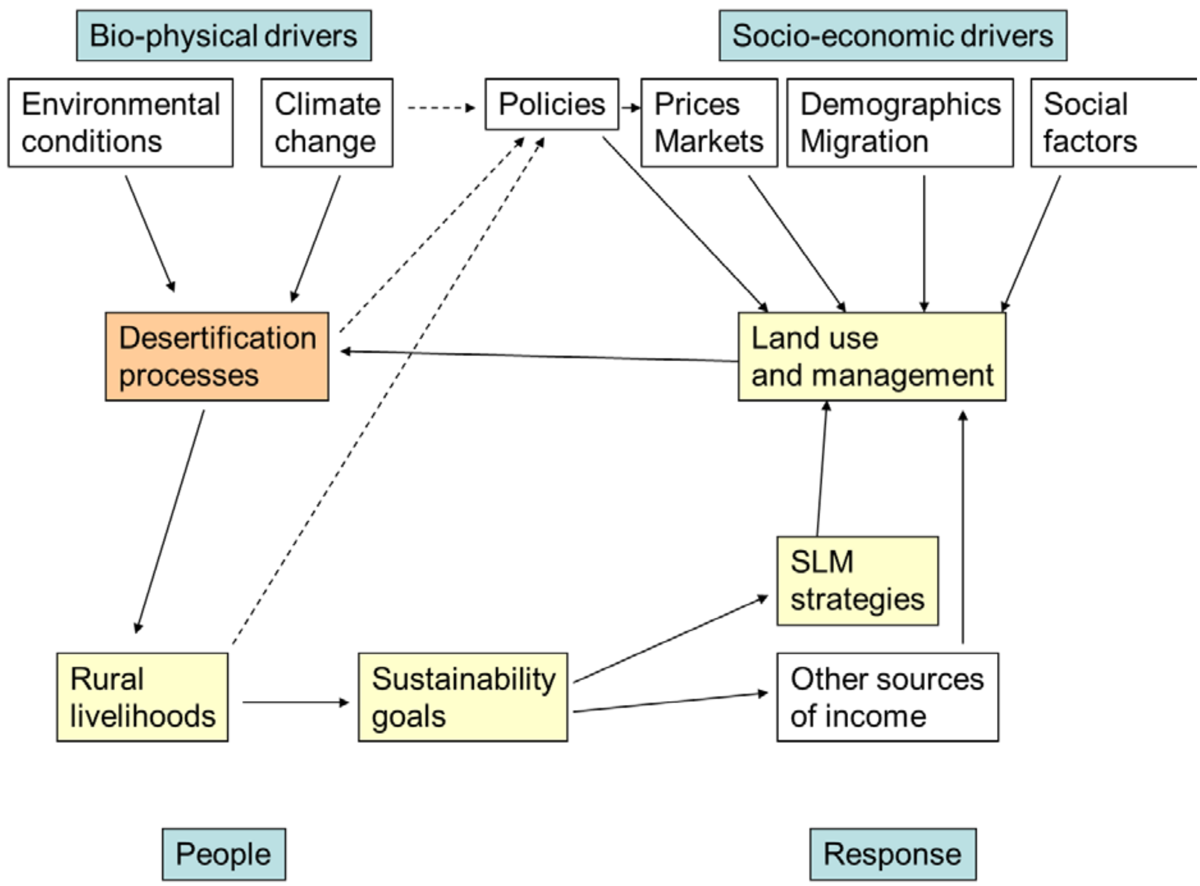


Figure 6-3 Conceptual framework of desertification developed by the DESIRE project.

The main drivers of desertification in the study sites were identified at field, local and policy level from three information sources: 1. the biophysical setting, socio-economic conditions, institutional and political setting, relevant end-users/stakeholders, and past- and ongoing projects in the study sites derived from the study site descriptions, 2. a questionnaire filled by the research teams on the

---

[15] Deliverable 1.1.1, downloadable from the HIS at http://www.desire-his.eu/en/study-site-contexts/desires-study-sites/525-compilation-and-synthesis-of-study-site-descriptions

relevant degradation types in the study sites, the perceived drivers of desertification and policies relevant to the desertification issue, their possible impact if known and the responses to desertification in the study areas, and 3. a questionnaire on the institutional capacity, received relevant institutions in the countries of the study sites. The main drivers of desertification are shown in Figure 6-4.

Outmigration and the decline of land management or poor land management were most frequently mentioned as drivers of desertification in the DESIRE study areas. Outmigration is indicative of a global trend of increasing urban population and declining rural population. The exodus of young people from rural areas means a loss of labour and social capital and the land use change and decline of traditional dry land farming causes a loss of knowledge of sustainable practices in these fragile environments. The pathways leading to poor land management varied considerably between the study sites. Land abandonment may be one of these, as in the case for the Macao and Goìs sites in Portugal, leading to biodiversity loss and soil erosion. Another pathway to poor land management was observed in the replacement of traditional agro-pasture practices by large scale mono-culture agriculture plantations (olives), such as in Tunisia, or by large scale pastures, like in the study sites in Russia, in both cases resulting in increased soil erosion by water.

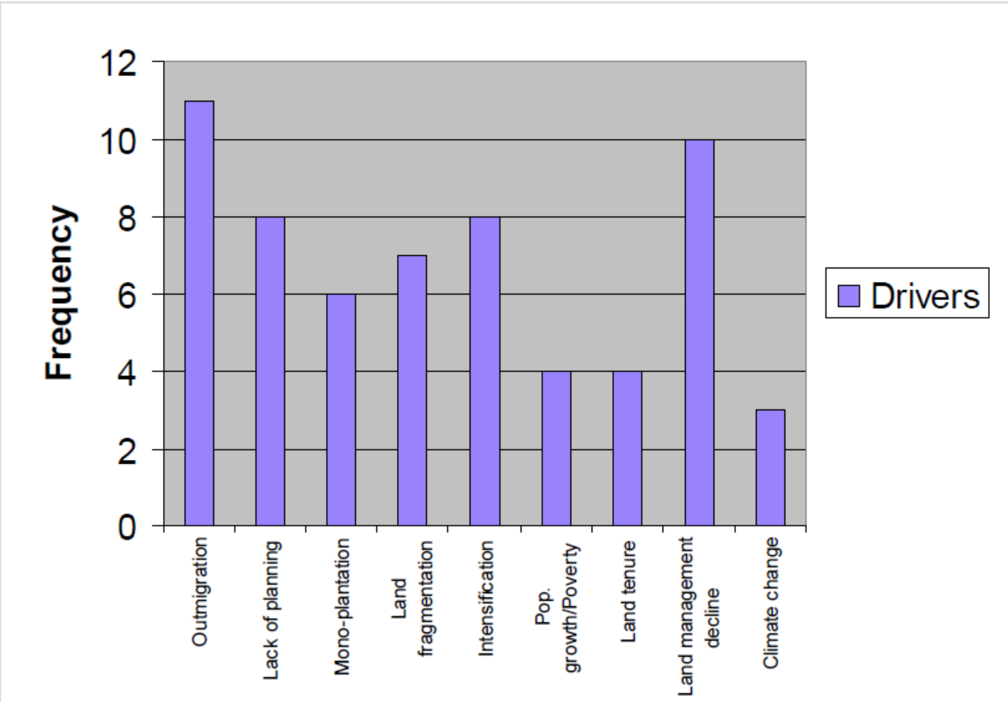


Figure 6-4 Drivers of desertification in the DESIRE study sites.

The role of policy

Land use changes are often the long term results of political and economic factors, related to national and international policies. The most important international policies relevant to the DESIRE study sites include the United Nations Convention to Combat Desertification, and its National Action Plans, the Agenda 21 and environmental action plans and protection laws and the Common Agricultural Policy (in sites part of the EU). At the national and local level, subsidy schemes, laws on irrigation, water management, waste and flood control were observed to be the most frequent responses from policy to desertification issues. Laws and regulations with regard to forestry and agriculture were also frequently mentioned as national policies addressing desertification. In only three study sites, explicit laws and national strategies on soil conservation and prevention and control of desertification exist.

In most of the sites, it was reported that although local and national laws exist, implementation was often ineffective. As a result, it was often the case that conservation laws or policies were not adequately enforced. A lack of cross-sectoral planning and collaboration was also identified as a common problem and although the EU Common Agricultural Policy has led to some positive impacts in some locations, it resulted in the cultivation of unsuitable land in other places.

The DESIRE project compiled detailed information on the **drivers of desertification including the effects of existing policies** in the DESIRE study sites[16].

6.4 The status of land degradation, sustainable land management and risk

In order to determine the current status of land degradation, DESIRE developed the WOCAT-LADA-DESIRE Mapping Questionnaire[17] and the online WOCAT-LADA-DESIRE Mapping Database to produce and store a series of maps that illustrate what type of land degradation is taking place, where and why, and what is being done in terms of sustainable land management. In each DESIRE study area, the WOCAT-LADA-DESIRE Mapping Questionnaire was completed by a team of local experts familiar with the area, including, where possible, agronomists, soil and water specialists and extension officers. An example of the resulting maps is given in Figure 6-5.

[16] Deliverables 1.3.1 and 2.1.2, downloadable from the HIS at: http://www.desire-his.eu/en/study-site-contexts/wp13-drivers-a-policy-thematicmenu-167/58-drivers-policies-and-laws-in-desire-study-sites
[17] https://www.wocat.net/en/methods/slm-mapping.html

Botswana - Boteti

The main land use type is grazing. Dominant types of degradation are water degradation in the areas with salt pans, and degradation of the vegetation in all other land use types. The biogas conservation technology documented in this book addresses the degradation of vegetation by finding alternative sources of fuel benefiting from the high livestock intensity (biogas). Roof rainwater harvesting offers an alternative water source in response to the declining groundwater table and the high salinity of this water source.

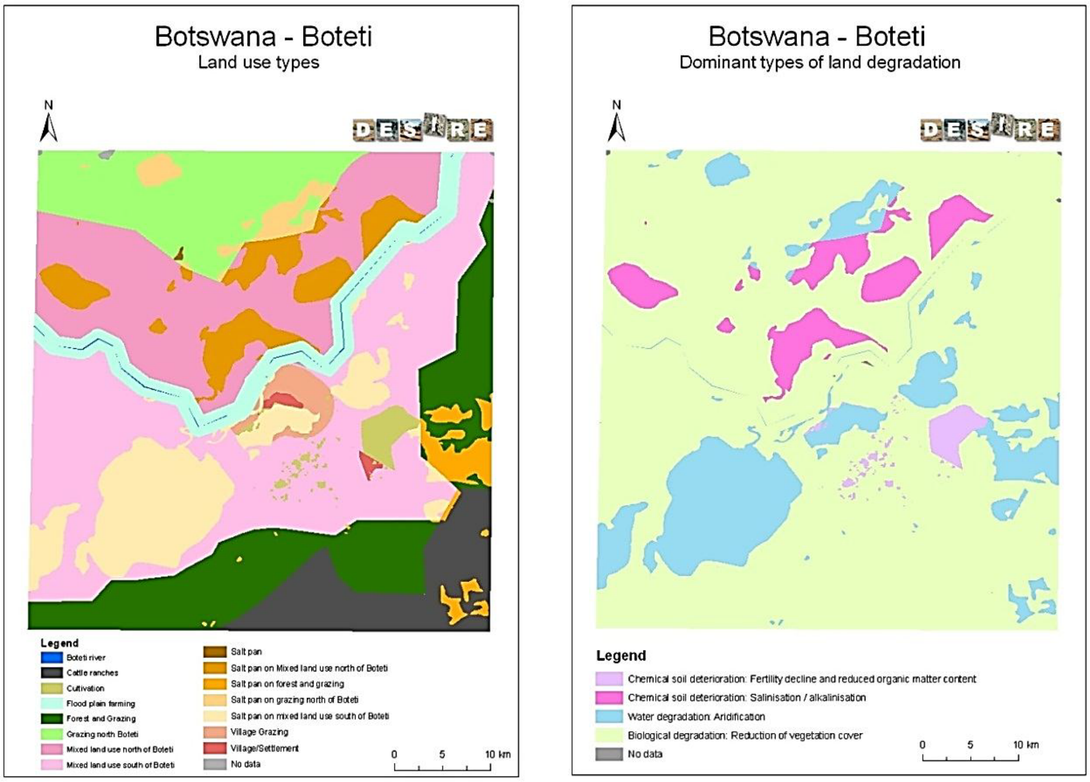


Figure 6-5 Maps of land use and degradation types in the Boteti study area produced with the WOCAT-LADA-DESIRE Mapping Questionnaire.

DESIRE assessed the **spatial extent of degradation and conservation in the DESIRE study sites**[18]. The mapping of land degradation and current SLM showed that land degradation in the 17 DESIRE study sites occurred dominantly in the form of water erosion on cultivated land, and on land under mixed use. Degradation was found to be increasing in most sites, mainly caused by inappropriate soil management. Indirectly, land degradation appeared to be caused most frequently by combinations of the factors population pressure, land tenure and poverty, combined with effects from governance, the functioning of institutions and politics. Land degradation negatively affected ecosystem services over almost the entire degraded area. Provisioning ecosystem services, such as the production of food, biomass, water and energy, were most affected in mixed land use, followed by cultivated land and grazing land. High negative impacts were observed on regulating ecosystem services (regulation of water and nutrient flows, waste, etc.), indicating that these require specific attention when developing and implementing remediation strategies. Existing SLM measures in the

[18] Deliverable 1.2.1; downloadable from the HIS at: http://www.desire-his.eu/en/study-site-contexts/wp12-assessment-and-mapping-thematicmenu-166/523-spatial-extent-of-degradation-and-conservation-in-desire-study-sites

study sites included mainly grazing land management technologies and conservation agriculture. SLM measures appeared most effective on cultivated land and in combinations rather than individually. Impacts of SLM on ecosystem services were most positive on regulating ecosystem services in forest and grazing land. Obviously there is scope for improving contributions from SLM to ecosystem services in cultivated land.

6.5 Determining desertification risk using indicators

Determine degradation risk, using an indicator questionnaire

Desertification and land degradation are complex processes with causes that range from climate change to changes in land use or alterations in environmental legislation. The way in which an area responds to these pressures is determined by the resilience of the landscape (soil, water, vegetation) and the local economy. As has been pointed out by the UNCCD[19], indicators can be valuable tools to help measure this resilience, and, as a result, can be useful in assessing how vulnerable an area is to desertification and how effective the actions being taken to mitigate that risk are. By using an appropriate number of indicators, complex processes such as soil erosion, soil salinization, and overgrazing may be effectively described without using complex mathematical expressions or models that require an excessive amount of data[20].

An environmental indicator is a parameter, which provides information about the situation or trends in the state of environment, in the human activities that affect or are affected by the environment, or about relationships among such variables (USA EPA, 1995; EEA, 1998).

[19] United Nations Convention to Combat Desertification
[20] For further information about indictors and their uses, see Department of Environment, UK, 1996 and EEA, 1998

Within DESIRE, an Expert System has been developed to calculate desertification risk for various desertification processes, using a limited number of indicators for each process (Figure 6-6). Data on these indicators can be collected using the **indicator questionnaire** developed in the DESIRE project[21], and entered in the **Expert System**[22] to inspect the desertification risk of specific dryland areas. Because of the distribution of DESIRE study sites in dryland areas around the world, the expert system can be applied globally in other dryland areas.

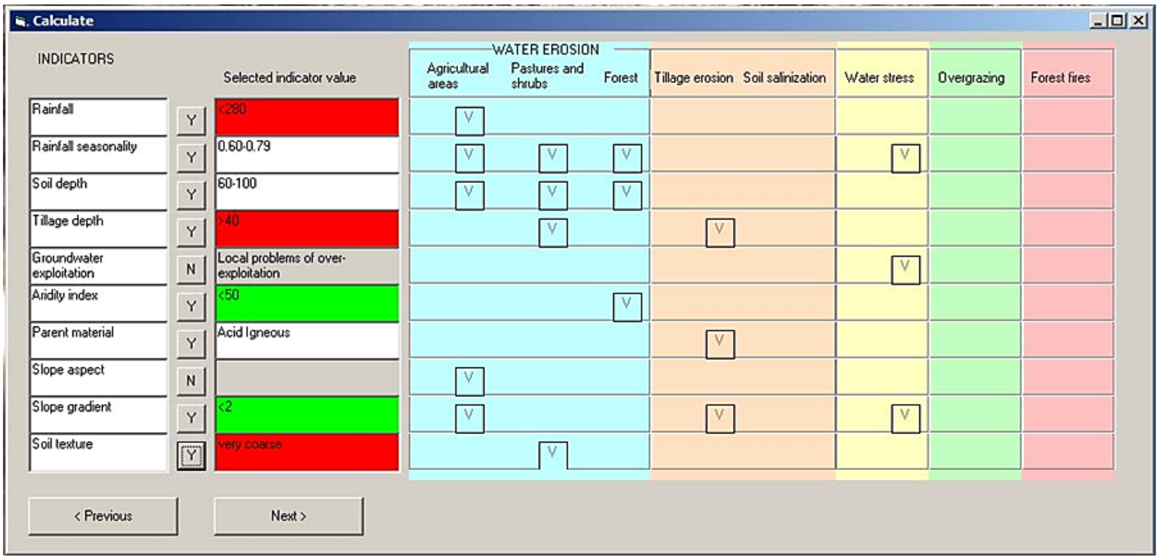


Figure 6-6 Expert system using indicators to assess desertification risk.

To develop the Expert System, the DESIRE project:

- Defined a practical number of indicators based on a shortlist of indicators available from literature, previous and ongoing research programs;
- Documented and developed a harmonized database of indicators used by different parties in the selected study areas, by conducting field surveys on prevailing land use types subject to desertification (Figure 6-7);
- Selected the most relevant indicators based on a statistical analysis of the harmonised database of indicators;
- Developed equations to calculate desertification risk for different degradation processes in main land use categories, based on the indicator database;
- Developed an expert system to calculate desertification risk using the developed equations.

[21] Downloadable from http://tinyurl.com/bmgr65p
[22] Downloadable at http://www.desire-his.eu/en/assessment-with-indicators/desertification-risk-assessment

Figure 6-7 Example of a study field used to collect data on indicators in the DESIRE project.

Table 6-2 Distribution of desertification risk estimated in the various study sites.

site no	Study site	Distribution of land desertification risk classes (%)				
		No risk	Slight	Moderate	High	Very high
1	Rendina Basin, Basilicata, Italy	0	0	0	0	100.0
2	Loess Plateau, China	22.8	21.7	16.5	21.3	17.7
3	Nestos Basin, Maggana, Greece	3.3	13.3	23.3	20.1	40.0
4	Gois, Mação, Portugal	13.1	31.1	16.4	16.4	23.0
6	Secano Interior, Chile	17.9	32.1	21.4	25.0	3.6
7	Boteti Area, Botswana	0	9.3	33.3	48.1	9.3
8	Novij, Saratov, Djanybek, Russia	0	1.2	37.4	61.4	0
9	Cointzio watershed, Mexico	0	32.2	27.6	33.3	6.9
11	Eskisehir, Konya, Karapinar plain, Turkey	0	0	0	100.0	0
13	Santiago Island, Cape Verde	14.6	7.8	18.4	1.9	57.3
14	Mamora/Sehoul, Morocco	10.0	10.8	19.2	47.5	12.5
15	Zeuss-Koutine, Tunisia	9.2	8.3	19.2	20.0	43.3
16	Guadalentin Basin, Murcia, Spain	1.7	30.6	45.4	19.0	3.3
17	Crete, Greece	10.0	21.6	19.0	35.6	13.8

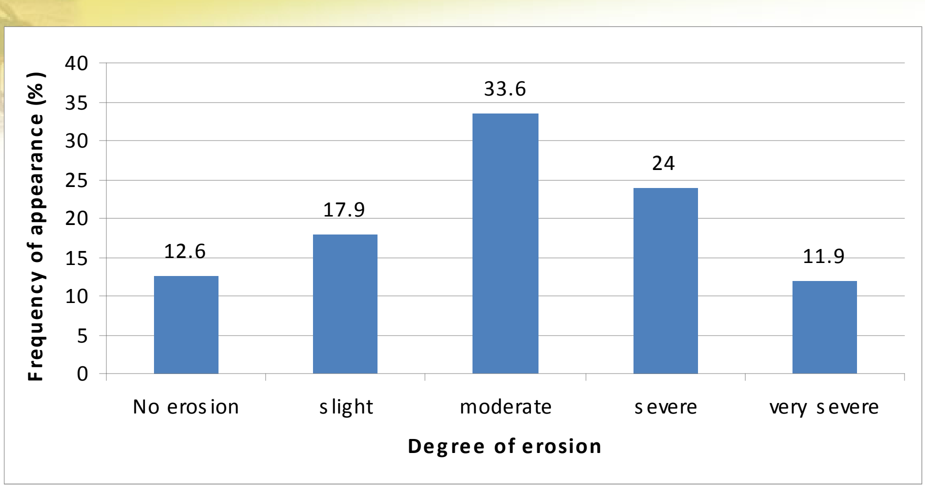


Figure 6-8 Distribution of degree of soil erosion classes identified in the study field sites

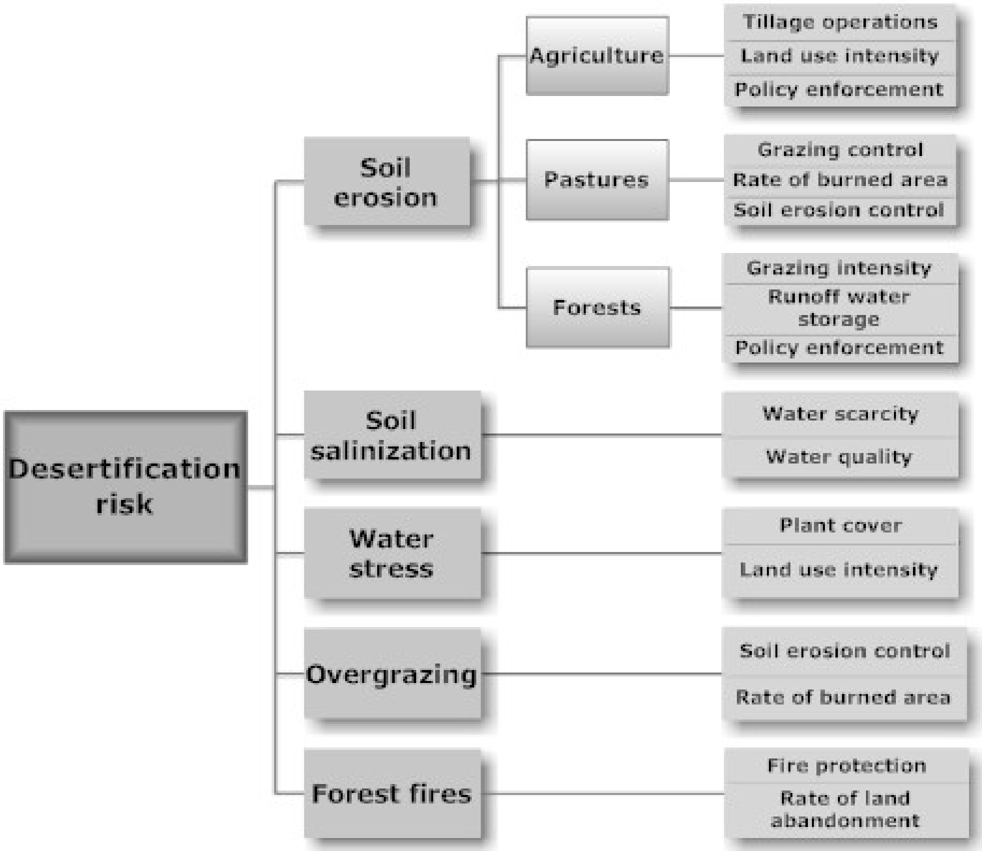


Figure 6-9 Most important indicators affecting desertification risk under various processes or causes of land degradation in the study field sites.

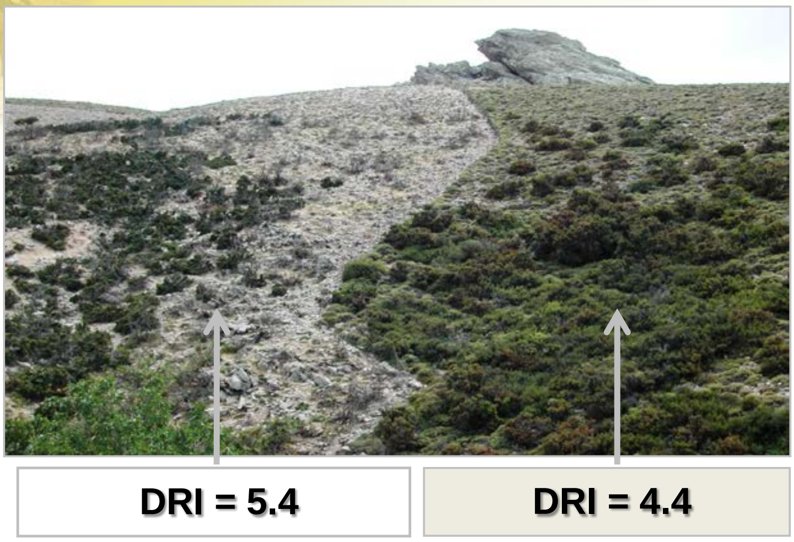


Figure 6-10 Example in using indicators for assessing desertification risk at field level.

Example from study site – Cape Verde

The DESIRE research team in Cape Verde completed 103 indicator questionnaires for soil erosion; 9 for forest, 26 for pasture and 68 for agriculture. Results showed that 57 % of the sites was at very high risk of degradation.

Outcomes of step 1 - Establishing land degradation, defining SLM context and sustainability goals

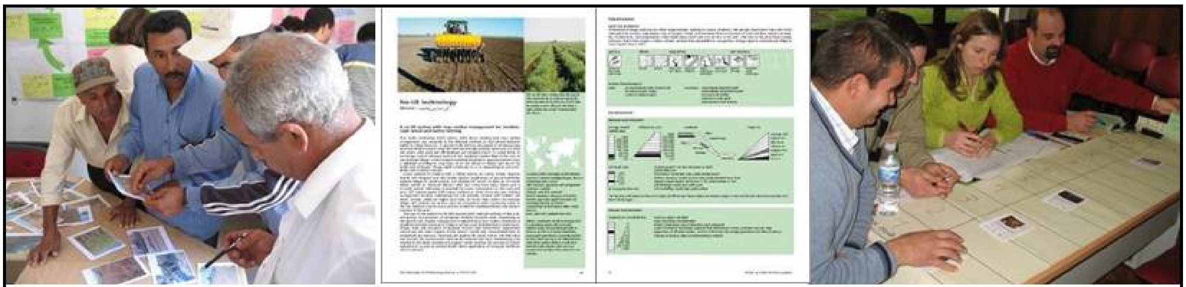
- Selection of 17 study sites - all affected by one or more desertification related problem and where previous or on-going research could be furthered;
- Identification of stakeholders at each site through a stakeholder mapping exercise. Stakeholders were of diverse gender, age and background, and represented Natural Resource Management Institutions, land users, NGOs and policy makers;
- Identification of various drivers, barriers and opportunities affecting sustainable land management, e.g. laws that exist but are not enforced; need for better cross-sectoral planning and collaboration;
- A series of maps documenting land degradation and conservation status;
- Calculations of future degradation/desertification risk from the DESIRE Expert System which can be applied globally in other dryland areas;

This information provided a picture of the land degradation and conservation activities for a district and is the basis for he **identification**, **assessment** and **selection** of appropriate SLM strategies.

7 Identifying, evaluating and selecting SLM strategies

This stage of the DESIRE Approach and project had three key elements: the WOCAT SLM database, a Decision Support Tool and participatory facilitation. The value of combining these elements is that stakeholders worked together from the very beginning to understand and evaluate SLM options. Each stakeholder group had an equal say in determining criteria for assessment of the options – thus learning about SLM options and also from each other. Workshops were held to collectively apply a 3-stage process to identify, evaluate and select promising SLM strategies for field testing (Figure 7-1).

Workshops followed a sequence of specific structured exercises. A key objective of this standardized programme was replicability and transferability beyond the DESIRE project. Details of the process.



Part I – Identification	**Part II – Assessment**	**Part III – Selection**
of existing and potential strategies with a participatory learning approach (stakeholder workshop 1)	Evaluation, documentation and sharing of strategies with standardised questionnaires	of the most promising strategies with a decision support tool (stakeholder workshop 2)

Figure 7-1 The 3-part methodology for identifying, evaluating and selecting SLM strategies developed in DESIRE.

The objectives of the two workshops were to:

- Initiate a mutual learning process among local and external participants through sharing experiences and jointly reflecting on current and potential. degradation/desertification problems and solutions.
- Create common understanding of problems, potentials and opportunities by integrating external and internal perceptions.
- Strengthen trust and collaboration among stakeholders.
- Identify existing and new strategies to prevent or mitigate degradation and desertification.
- Select strategies – with consideration given to the impact on women - for further evaluation and documentation with the WOCAT methodology.

7.1 Identifying SLM strategies, using a participatory learning process.

Introduction

Land owners and farmers have been managing their land for centuries and, as a result, they often have a wealth of SLM knowledge and experience, as well as demonstrating, in some cases, truly innovative approaches to land management challenges. Before envisaging new technical solutions to combat desertification and land degradation, therefore, it is of real value to examine what is already applied locally. With this in mind, it makes sense to listen to those people who know the land best when looking to identify existing SLM strategies. In other words, it is time to learn from the people who work on and manage the land on a day-to-day basis.

Aims and objectives

The aim at this stage is to work with stakeholders to identify promising SLM strategies for further assessment. Using a stakeholder workshop and taking a collective learning approach to this stage enables stakeholders to identify potential strategies and, as a result, fosters a sense of participation and input into the research process.

The workshop program followed a logical and consecutive sequence of specific exercises, each with its own objectives, method, procedure, and expected results[23]. Overall, the workshop objectives were as follows:

1. To initiate a mutual learning process among local and external participants by sharing experience and jointly reflecting on current and potential problems and solutions regarding land degradation and desertification.
2. To create a common understanding of problems, potentials and opportunities of the respective study site by integrating external and internal perceptions.

[23] For detailed information about these exercises, see http://www.desire-his.eu/en/potential-strategies/part-1-identifying-strategies-thematicmenu-177

3. To strengthen trust and collaboration among stakeholders.
4. To identify existing and new strategies to prevent or mitigate land degradation and desertification.
5. To select strategies for further evaluation and documentation with the WOCAT methodology.

The outcome of this initial stakeholder workshop was a set of SLM strategies (either existing or potential) that have been selected by the relevant stakeholders.

Example from study site – Portugal

The DESIRE study sites in Portugal (*Mação and Góis*) combined efforts in a single workshop.

View of Mação municipality

View of Góis municipality

17 people took part in the 2-day workshop; 6 of these were external stakeholders e.g from Ministry of Agriculture, Rural Development and Fisheries. Workshop went through 7 exercises:

1. Picture gallery – land degradation and conservation
2. Water cycle and biomass cycle – disturbances and solutions
3. Local indicators of land degradation and conservation
4. Stakeholders – interest and influence on SLM
5. Assessment f already applied and potential solutions
6. Strategy for SLM
7. Workshop evaluation

This resulted in the selection of Implementation of a forest intervention plan (ZIF): Management plan (Approach), Primary tracks (Technology) and Prescribed burning (Technology) for description with the WOCAT questionnaires.

Steps in the water cycle exercise

Figure 7-2 Examples of WOCAT QT/QA from different DESIRE study sites.

7.2 Evaluating existing Sustainable Land Management strategies using WOCAT questionnaires

Introduction

Following the initial stakeholder workshop, the suggested strategies were documented and evaluated in a structured and standardised way to enable information to be shared as easily as possible with other land managers around the world.

Aims and objectives

The aim of this stage is to evaluate the effectiveness of the identified SLM strategies, both in terms of the technical measures applied in the field, i.e. SLM technologies, and the ways and means of support that help to introduce, implement, adapt, and promote those technologies, i.e. SLM approaches. Thus, the objectives of this stage are:

1. to document and evaluate each identified locally applied technology and approach in a structured and standardized way,
2. to guarantee a certain level of data quality through a review and quality assurance process, and
3. to enter this information into the WOCAT database in order to share it with other actors involved in SLM around the globe.

Methodology

To evaluate identified SLM strategies, the WOCAT programme has developed comprehensive questionnaires and an online database. The use of questionnaires follows a structured and standardised process which helps to better understand the reasons behind successful sustainable land management technologies and approaches. The corresponding database serves as a basis for knowledge exchange between stakeholders in different sites and with other land managers around the world.

This standardised evaluation involves the use of two **questionnaires**[24], one on SLM **technologies** (QT) and the other on SLM **approaches** (QA). Together the corresponding technology and approach describe a sustainable land management strategy within a selected area. SLM *technologies* are the physical practices in the field, like mulching. In WOCAT, these are subdivided in four groups: agronomic, vegetative, structural and management measures. An SLM *approach* includes the ways and means of support that help to introduce, implement, adapt, and promote SLM technologies on the ground.

For ***SLM technologies***, the questionnaire addresses the specifications of the technology (purpose, classification, design and costs) and the natural and human environment where it is used. It also includes an analysis of the benefits, advantages and disadvantages, economic impacts, and acceptance and adoption of the technology. Impacts are approximated through simple scoring, but supplemented by data where available. For ***SLM approaches,*** questions focus on objectives, operations, participation by land users, financing, and direct and indirect subsidies. Analysis of the approach described involves monitoring and evaluation methods, as well as an impact analysis.

[24] Both questionnaires can be found on the WOCAT website at http://www.wocat.net/en/methods/case-study-assessment-qtqa/questionnaires.html.

The WOCAT Database acts as a basket of diverse options and ideas, which can be used as a model for the development of a context specific version but should not be confused with a blueprint solution. Biophysical and socio-economic conditions vary so much between sites that the options from the WOCAT Database must be assessed and reflected, and where necessary adapted to local circumstances, such as to local plant species, slope conditions or market mechanisms.

7.3 Selecting sustainable land management strategies; the decision support process

Aims and objectives

The aim of this third and final stage of the selection process is to select promising (existing and potential) SLM strategies for field testing in the study sites. Taking the options identified and selected in the previous two phases along with additional options from the global WOCAT database, this stage involves stakeholders working together to jointly select the best strategies that will then be tested in the field.

This stage uses a second stakeholder workshop, which builds on the analysis and discussions made in the first one. The main aim of this process is to jointly select one or two SLM options to be tested in the selected study site. The second workshop, therefore, has the following objectives:

1. Select possible implementation options from a basket of options, including those originating from the study area and those available in the online **WOCAT Database on SLM Technologies and Approaches**[25];
2. compare, score and rank these options;
3. negotiate the best option for implementation; and finally
4. decide upon one or two SLM strategies for implementation.

Methodology

The selection of the most promising SLM option for implementation is complex and requires the stakeholders to carefully consider both the costs and benefits for man and ecosystem. To guide the workshop participants through the decision-making process and allow them to negotiate the best option(s) in a structured way, the methodology applied in this stage consists of three main elements: (i) the WOCAT database is used to choose the options or strategies of land conservation; (ii) Decision Support System (DSS) software is used to support the single steps of the evaluation and decision-making process and, finally, (iii) a participatory approach guides and leads workshop participants through the process of evaluation and decision-making.

Facilitated by the workshop moderator, participants conduct a multi-criteria evaluation to rank existing and potential SLM technologies and/or approaches for field trials. This involves stakeholders identifying and weighing relevant criteria (e.g. technical requirements, costs and benefits of implementation, social acceptability, etc.) and taking into account the technical, bio-physical, socio-cultural, economic and institutional dimensions. The only purpose of the Decision Support Tool is to

[25] The WOCAT Database on SLM Technologies and Approaches can be accessed on http://www.wocat.net/en/knowledge-base/technologiesapproaches.html

calculate what participants evaluate in the course of the different working steps, and to visualise it. The decision support software is used in the stakeholder workshop, but many steps are done on paper and without a computer. Within the DESIRE project, the open-source software 'Facilitator'[26] proved to be most suitable for the envisaged purpose, mainly because it is simple and adaptable to almost any situation requiring negotiation and decision by a group of stakeholders.

[26] Heilman et al., 2002

Example from study site - Tunisia

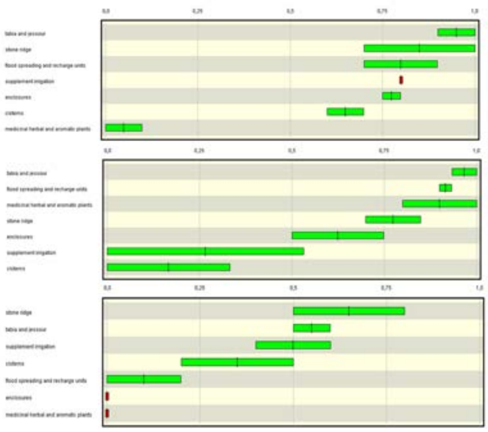
The 2nd stakeholder workshop was attended by 29 people, 10 of which were external. Apart from farmers and scientists, representatives of NGOs and Government (Commissariat Régional de développement agricole de Médenine) also attended.

The workshop encompassed 9 steps:

1. Review and adjustment of objectives
2. Identification of options
3. Identification of relevant criteria
4. Scoring the options
5. Creating a hierarchy and ranking criteria
6. Analysis and interpretation
7. Prioritisation of the options – negotiation and decision making
8. Embedding into overall strategy
9. Evaluation of the workshop

Workshop resulted in the selection of Tabias and Jessours for test-implementation.


Working group scoring options



Summary

Overall, the step-by-step process for the identification, assessment and selection of SLM options described above is fairly easy to apply and, when done properly, helps to successfully facilitate joint decision-making processes among stakeholders. As described, this stage has, at its core, three key elements: the WOCAT Database on SLM Technologies and Approaches, the Decision Support Tool and participatory facilitation. What is most valuable about the combination of the three key elements is that it makes the stakeholders work together from the very beginning to understand and evaluate the SLM options. Each stakeholder group has an equal say in determining the criteria that they will use to assess each SLM option and in doing so, they not only learn about SLM options, but also learn from each other. They are forced to consider each other's positions and opinions, before entering into negotiations to come to an acceptable decision. This leads to solutions being selected that are not only widely accepted, but also financially feasible. In addition, the process creates a sense of ownership of the implemented choices.

Table 7-1 Technologies selected during WS2.

Study site	Technology 1	Technology 2	Technology 3	Technology 4
Spain	Reduced tillage	Ecological agriculture (reduced tillage and green manure)	Organic mulch	Traditional water harvesting structures (Boqueras)
Portugal	Prescribed fire	Preventive forestry		
Greece – Crete	No tillage			
Greece – Nestos	Transport of freshwater from local streams			
Turkey – Karapinar	Caragana korschinskii planting	No-till technology		
Turkey – Eskisehir	Fanya juu terraces	Stone bund of Tigray	Contour planting	Caragana Korshinskii planting
Morocco	Vegetative strips	Treatment of gullies		
Tunisia	Tabia and jessour	Flood spreading & recharge units	Cisterns	
Russia – Djanybek	Drip irrigation with supplied water			
Russia – Novy	Drip irrigation			
China	Level bench terrace	Reforestation		
Botswana	Using bio-gas instead of firewood			
Chile	Zero tillage approach	Agroforestry	Crop rotation with legumes	
Cape Verde	Afforestation	Vegetative barriers		
Mexico	Agronomical strategies	Wood saver ovens	Run-off control gullies	

Outcomes of step 2 – Identifying, evaluating and selecting SLM strategies

Workshop participants came from a variety of backgrounds and expertise, from local farmers to regional and national decision-makers. Feedback included praise for the opportunity to share experiences, be heard and participate in discussion about management of local resources. Field sites selected at least one SLM technology based on running the Step 1 information through this Step 2 process. Importantly, they knew why they had selected the SLM strategies that would now move to the Step 3 testing stage.

8 Trialling and monitoring selected SLM strategies

8.1 Introduction

A core focus of the DESIRE project was exploring the potentials of SLM strategies to prevent and combat degradation and desertification in a range of dryland areas around the world. Therefore field trialling of the SLM strategies selected through the previous steps played a central role in the overall project, and testing of the DESIRE approach. More than 20 SLM strategies were put to the test in 33 trials conducted at 16 study sites in 12 countries.

Table 8-1 gives an overview of the locations and desertification problems that were the focus of the trials summarized in one sentence. More detailed information about the sites can be found on the HIS (www.desire-his.eu).

Table 8-1. Brief descriptions of the bio-physical aspects of desertification on the sites.

Nr	Site	Desertification processes
1	Spain - Guadalentin Basin, Murcia	Drought, Soil erosion by water
2a,b	Portugal –Mação & Gois	Forest fires, vegetation degradation, soil erosion
3	Italy - Rendina Basin(*, Basilicata	Soil erosion by water, dam siltation
4a,b	Greece – Crete	Soil erosion by water, overgrazing
5	Greece - Nestos Basin, Maggana	Salinisation, irrigation problems
6	Turkey - Konya Karapinar Plain	Soil erosion by wind, drought, grazing problems
7	Turkey - Eskisehir Plain	Soil erosion by water
8a,b	Morocco - Mamora/Sehoul	Soil erosion by water, gullying, drought
9	Tunesia - Zeuss-Koutine	Drought, competition for scarce water resources, rangeland degradation
10	Russia – Djanybek	Water logging caused by over irrigation, salinization in depressions
11	Russia - Novij, Saratov	Water logging and leaching of chemicals, caused by over irrigation, erosion caused by flow irrigation
12	China - Loess Plateau	Soil erosion by water
13	Botswana - Boteti Area	Fuelwood depletion causing envir. Degradation
14	Mexico - Cointzio catchment	Soil erosion by water, dam siltation.
15	Chili - Secano Interior	Fertility and mono culture leqading to envir. Degradation, soil erosion by water, gullying
16	Cape Verde - Santiago Island	Soil erosion, drought, flash floods, dam siltation.

8.2 Aims and objectives

The objective of this part of the project was to test the effectiveness of the conservation and mitigation measures selected by the stakeholders in an interactive series of meetings using the WOCAT system.

The main aims of testing the SLM technologies were to evaluate their effectiveness for: 1) mitigation of the biophysical problems of desertification processes, and 2) improvement of the situation/livelihood for the stakeholders. These aims were related to the overarching DESIRE goals of avoiding further environmental degradation and having SLM strategies be socio-economically acceptable so they will be implemented.

8.3 Methodology

To accomplish the aims it was imperative that:

- The experiments be directly visible and executed on a stakeholder level (field scale);
- The results, good or bad, be made clear in both scientific and non-experts language;
- The technologies chosen be 'proven' technologies so that stakeholders are not being asked to gamble with their income. This implied that, while new to the area, the SLM technologies are in most cases not innovative. The WOCAT database served as the source of proven SLM technologies.

In the previous step of the DESIRE project, one or more conservation technologies were chosen for testing through multiple year field trials. In this step all site coordination teams and farmers employed the following implementation process which ensured a certain degree of consistency in the design, monitoring and comparison of results across such a wide range of bio-physical and socio-economic settings.

1) Background and general information phase: Collection of background data, information from previous experiments and general site information.

2) Design phase: Creation of a detailed *Site Implementation Plan* (SIP) according to a standard blueprint provided to all study site groups (Table 8-2).

The DESIRE SIP was designed to capture a summary of key conditions at the location, a short description of the SLM technology(s) selected, experimental setup, detailed monitoring activity plan divided into several categories and the final assessment criteria. The trials were designed as much as possible as a comparative study: two or more adjacent fields or plots where usual farm practices are compared to a conservation technology. Where this was not practical, e.g. forest fires, testing a biogas installation, or rangeland resting, different test designs were developed. The **compiled SIPs** are contained in the **deliverable 4.1.1**[27].

A) General: Location of the monitoring plots B) Summary: Brief summary of the problems at this particular location and the SLM technologies chosen, based on the site descriptions and summary of the WB3 outcome C) Location description: coordinates; Google Earth picture if applicable; brief overview of environmental setting (soil types, relief, climate); photo's of the plot/field location D) Stakeholder info if applicable: name, level of technology applied on this location E) Land use: crops, rotation, tillage practices, grazing practice etc. F) Conservation measures and experimental setup: short description of SLM technologies, experimental setup, plot layout, situation map/sketch G) Monitoring activities: a. Climate/rainfall monitoring details b. One time measurements (usually environmental, topography etc) c. Repeated visual monitoring supported by digital photography (soil cover, structure, tillage activities, erosion traces etc) d. Repeated measurements (instrumental monitoring and logging) e. Stakeholder activities (tillage activities) H) Yield assessment or assessment of other returns (quantity, quality), general stakeholder appraisal.

Table 8-2. Information in the Site Implementation Plan (SIP), layout and sections (see deliverable 4.1.1)

3) Implementation phase: Collection of pre-treatment data and implementation of the SLM technologies.

During this phase, practical adaptations were made by the site coordination team in discussion with the stakeholders to better fit the circumstances. This happened, for example, in site 6 (Turkey, Eskeshir area) where sloping terraces with vegetation barriers were created, instead of fully constructed level terraces.

The SLM strategies to be tested were chosen from the WOCAT database. An overview of the experiments, organized according to similarity, intended function and location is presented in Table 8-3. Women as well as men were involved as local project partners. More detail about the SLM strategies can be found in **deliverable 4.3.1**.

[27] Downloadable from the HIS at: http://www.desire-his.eu/en/implementing-field-trials/methodologies.

Table 8-3. Experiments organized in functional groups, according to their intended effect on desertification processes.

#	Functional group	Description	Sites
1	Minimum Tillage	Minimum and no tillage experiments with and without additional agronomic operations such as herbicide control and deep ploughing	Spain, Chile, Morocco, Greece (Crete), Turkey (Karapinar)
2	Soil cover management	Mulch and stubble mulch, Green cover and green manure, crop rotation and intercropping to promote cover and have additional production	Greece (Crete), Spain, Turkey (Karapinar), Chile, Mexico
3	Runoff control	Contour ploughing and runoff barriers (wicker fences), gabions in gullies. Terracing also controls runoff but these are grouped under water harvesting,	Turkey (Eskesehir), Cape Verde, Spain
4	Water harvesting	Runoff water harvesting systems with and without terraces, bench terraces and check dams	Spain, Tunisia, China, Cape Verde
5	Irrigation management	Fresh water irrigation and drip irrigation for salinity control	Greece (Nestos), Russia (Dzhanybek, Novy)
6	Rangeland management	Fencing and set aside of rangeland, also gully control with fodder species, also biogas to conserve fuelwood.	Morocco, Tunisia, Botswana
7	Forest fire management	Techniques to combat forest fire	Portugal (Macao, Gois)

4) Monitoring phase: Regular reporting by study sites based on the variables and situations described in the SIP.

To help in deciding which monitoring techniques to apply, the DESIRE project compiled a document called "Guidelines for field assessment" (deliverable 4.2.1). An overview of measurement and monitoring equipment is also given in deliverable 4.1.1.

5) Analysis: Analysis conducted on various levels. The experimental setup provides for a "non-treated" field or plot against which the effect of the technologies is compared.

Bio-physical analysis was done by direct data comparison using statistics where possible on the main variables measured. These were backed up by visual comparisons and previous data collected at the sites. Most sites concentrated on meteorological variables, soil moisture, soil structure related parameters, plant cover and yield quality and quantity. Occasionally chemical and/or organic matter analysis were also used.

Socio-economic analysis was done by means of an adapted version of the impact section of the WOCAT technology questionnaire (QT) which considers production & socio-economic, socio-cultural, ecological and off-site effects of the tested SLM technologies. The benefits and limitations of the SLM technology are appraised with respect to the 0-situation. The extensive list of questions in the WOCAT QT were condensed into 59 questions that could be scored as positive or negative (for instance: 'increase in crop yield' and 'decrease in crop yield' became 'crop yield' and could be scored with +20 or, for instance, – 5.) For the sake of displaying the results into readable tables, some questions were grouped if they were related (see Table 8-4).

Table 8-4. Final set of factors used to summarize the answers to the questionnaires.

Production & Socio-economic	Ecological
crop yield	water availability /quality
fodder quantity & quality	*runoff and soil loss*
animal production	*groundwater recharge & drainage*
wood production	*wind erosion*
water use / irrigation	*plant cover/ biomass/ om/nuts*
income / reduced producrion risk	crusting and compaction reduction
production area	*reduced salinity*
labour / farm operations	*reduced fire risk*
	biodiversity and habitat
Socio-cultural	**off site**
cultural opportunities	*water availability*
recreational opportunities	*reduced flooding*
community strengthening	*stream discharge*
conservation knowledge	*reduced downstream siltation*
conflict mitigation	*reduced groundwater / river pollution*
situation disadvantaged groups	*buffering capacity*
food security/self sufficiency	*reduced wind transpored sediments*
health	*reduced damage neighbour fields*
	reduced damage infrastructure
	reduced grazing other areas

The questionnaires were filled in by the site coordination teams, as many of the questions were very specific, requiring a specialist background to answer. However many discussions were held with the stakeholders during and after the experiments so the evaluation reflects their perspective. Where the results of the experiments were counterintuitive or disappointing, this was noted objectively.

The field trial results were also used to gain insight on how to improve the indicator system for desertification risk assessment developed earlier in the project.

8.4 Results

Due to the large amount of data collected on each site, including both the bio-physical and socio-economic evaluation results for each experiment, a 3-5 page summary was produced for each technology tested at each site (Fig. 8-1). These summaries are formatted and written to be easily read by non-experts, to improve their usefulness and go beyond the immediate scientific results. The actual results are summarized along with the evaluation from the WOCAT questionnaire and put into context of the site's problems. Conclusions are also drawn with respect to the possibilities of implementation on a larger scale and degree of success. These summary statements are based on both the scientific results and the discussions with stakeholders held by the site coordinators.

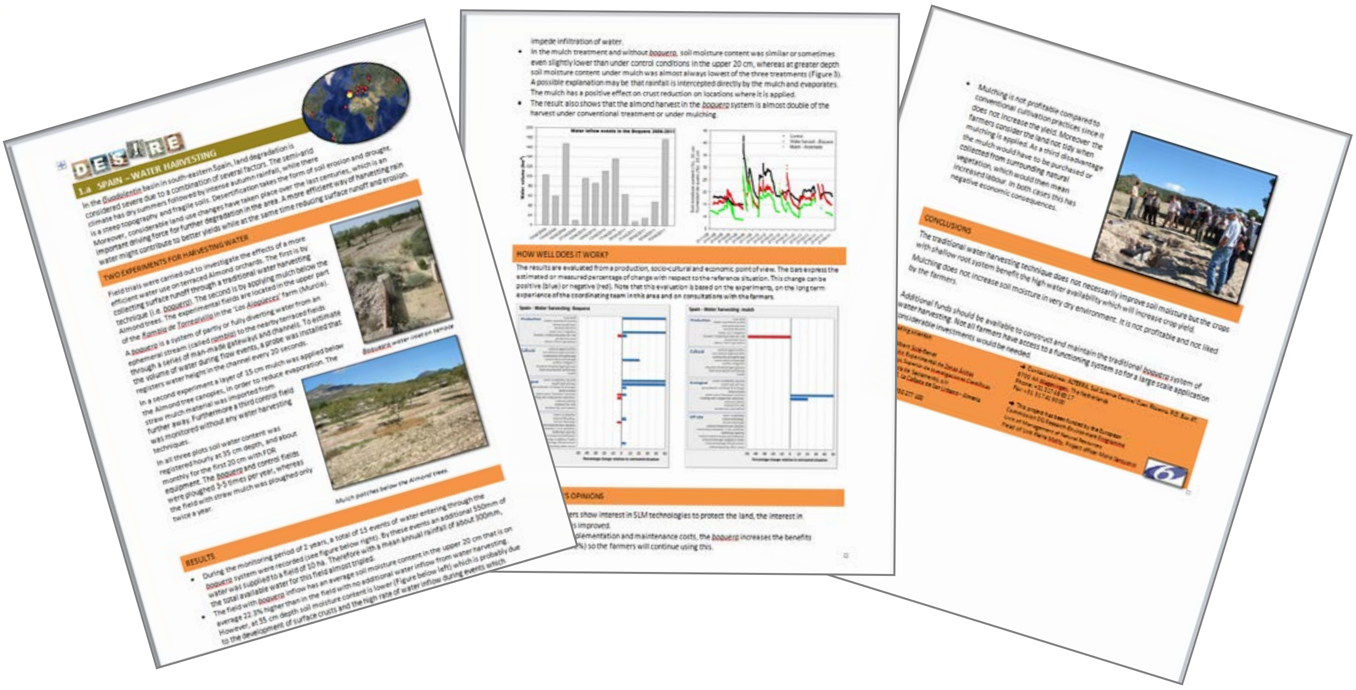


Figure 8-1. Example of the trials summary format from one site (Spain).

Every SLM technology tested had some positive biophysical effects at almost every site tested. Where this was not the case, as with minimum tillage in Morocco, it was because the trial was unfortunately conducted on (stony) soil unsuitable for the technology. At the same time there are, in most cases, socio-economic issues that came to light through discussion with stakeholders which present challenges for more widespread implementation of the technologies despite their effectiveness.

A brief overview of the results of SLM technologies tested at multiple sites, arranged by their WOCAT classification, are presented below. More detail on the **results from all trials** can be found on the DESIRE-HIS website and in **deliverables 4.3.1 and 4.5.1**. Capturing the socio-economic-cultural perspectives related to broader implementation of the tested strategies, in addition to the biophysical effects, creates a vital link for being able to put science into sustainable practice at the local level. The similarities and differences between the results for a given SLM technology at different sites emphasizes the importance of strategy selection based on site specific conditions rather than blanket recommendation. These results again illustrate the value of the multi-stakeholder dialogue that is so central to the DESIRE process, and provide insight into institutional and policy changes that are also needed to support the combat against degradation and desertification in drylands.

Summary of results – Agronomic SLM Technologies

SLM Tech	WOCAT code	Spain	Greece – Crete	Turkey – Karapinar	Morocco	Mexico	Chile
Minimum tillage	**A3**	Reduced soil and water loss; no effect on yield; low operational costs.	Reduced runoff and soil loss; higher soil water storage and biodiversity, lower soil temperature; lower labour and fuel costs; knowledge transfer needed for wider adoption.	Increased sprouting intensity; reduced yields; less wind erosion; specialized equipment and knowledge required.	No clear results; trial conducted on (stony) ground unsuitable for minimum tillage; slight increase in yield considered to be from fencing which reduced grazing; reduced grazing area very unacceptable; may have different effect in a different soil.	Minimum tillage helps control erosion; farmer involvement is possible if programs bring money to do concrete actions; farmers do not see a direct interest because the focus was at watershed scale; to reduce sedimentation of the dam an integrated policy is needed.	Greatly reduced soil loss; reduced runoff; increased soil cover and soil organic matter; slightly lower yield except when combined with subsoiling – which increased yields; some cost reductions, but other cost increases for herbicides or special farm equipment.

SLM Tech	WOCAT code	Spain	Turkey - Karapinar	Morocco
Mulch residue Stubble fallow	**A1**	Reduces crust formation; no increase in soil moisture, often a reduction; no yield benefit; unsightly; extra labour.	Increased yields, less wind erosion; required fallow parcel reduces annual income.	Mulch seems to have intercepted rainfall and reduced the amount reaching the soil; no other effects noted.

Summary of results – Vegetative SLM Technologies

SLM Tech	WOCAT code	Portugal – Macao	Portugal - Gois
Fire break, prescribed burning	**V3**	Tree species and terrain slope gradient impact runoff and erosion risk in the fire corridor network; Flat Eucalyptus and Pine sites had least soil loss, flat Shrubland (limited vegetative cover) and sloped Eucalyptus had the most; erosion risk now better integrated into design; high costs require full public support; technology capacity also important.	Reduced fire risk; improved grazing pastures; cost effective; accepted by local stakeholders; offers diversification potential for local community; fire can increase soil water repellency, runoff and erosion; insights gained regarding catchment management before and after fire; winter prescribed burns cause less soil damage than summer wildfires; requires involvement of local authorities.

Summary of results – Structural SLM Technologies

SLM Tech	WOCAT code	Russia – Dzhanybek	Russia – Novy
Drip irrigation	**S9**	Effective for cultivation of tomatoes and other vegetables; large increase in yields with high quality; large reductions in water use and labour; increases water available for households; very adaptable to the soil conditions and local sources of fresh water; can be used by farmers of all sizes; Initial setup costs are main constraint to wider use.	Improves moisture regime and water availability in root zone; avoided runoff, erosion and deep percolation associated with furrow irrigation; same yield with 80% less water; can be adjusted to match variation of plants water consumption during growing season; considerable reduction in workload; Initial costs are barrier to adoption.

SLM Tech	WOCAT code	Spain	Tunisia
Water harvesting	**S5**	Boquera technique – no real increase in soil moisture, however more water for shallow rooted crops; higher yields; considerable investment required for wide use.	Jessours and recharge wells are effective at capturing water for crops and aquifer recharge – but they depend on sufficient rainfall to create runoff; in very dry years recharge does not occur – showing the fragility of the system; younger people need to be taught about this.

SLM Tech	WOCAT code	Morocco	Mexico
Gully control	**S3**	Decreased erosion; increased quantity and quality of fodder; degraded areas restored; potential to reduce overgrazing of forests due to more fodder; large initial investment and time required; decreased grazing area for several years; demo sites needed to show benefits and promote acceptance.	Check dams were effective for controlling gullies; 80% of check dams had very little or no sediment, the dams with sediment were at the upper part of the gullies; Check dams should be constructed starting in the upper part of a watershed and using spatial analysis; farmers are interested in soil conservation but think that the dams are probably not useful.

Summary of results – Management SLM Technologies

SLM Tech	WOCAT code	Greece – Crete	Tunisia
Fencing or rangeland resting	**M5**	Much less surface runoff and sediment loss; increased plant cover and biodiversity; higher soil organic matter content and water storage; reduced farm income from reduced number of animals; farm subsidy policy changes needed and/or alternative income opportunities.	Increased plant cover and diversity – especially in dry years; requires community management of lands; may mean a change in grazing culture and require subsidy for fodder.

SLM Tech	WOCAT code	Mexico	Chile	Cape Verde
Rotation, fertility, plant type	**M5**	The experiment stared late so there are no definite conclusions, however farmers are interested in taking action against erosion and are interested in this approach.	N-fixing legumes - Diversified income source offers opportunities; increased surface coverage, biomass and carbon sequestration; complementarity between crop and livestock management; difficulty in marketing new crops; specialized equipment needed.	Pigeon peas – Improved vegetation cover; reduced surface runoff and erosion; increased crop yield and biomass; increased fodder from pruning; increased income potential; potential concern regarding downstream water flow due to reduced runoff.

The following general conclusions can be drawn from the field trial results.

i) There are few universal best practices to be found: each situation is unique in its context. The three categories, bio-physical, economic, and socio-cultural are equally important to understanding final results.

ii) Experimental fields/plots form a very good basis for discussion of technologies with farmers, although the general interest varies per site, they exist at a “stakeholder scale”.

iii) An integrated approach is necessary and there is a difference in an implementation on a plot or field, and a large scale implementation in a site.

iv) Large scale implementation of technologies often means a drastic change in the way people are doing farming and this can only happen if the economic benefits are clearly there.

v) The main socio-cultural effect seems to be a better understanding of desertification and conservation, but these are still very complex processes.

vi) In areas where the productivity is not very high and farming does not offer perspectives for the future there is little incentive to change methodologies drastically or go for whole scale protection of areas.

Regarding improvement of the indicators system for desertification risk, the desertification index tool was used to assess the "risk level" of the test sites both before and after implementation of the SLM technologies. This was to evaluate the system and look for opportunities for future development of the system.

The system generally did what it was expected to do and the risk factors reflected the experiments as reported in deliverable 4.3.1 quite well. Some experience and knowledge is needed to operate the system correctly. Two clear recommendations for a future extension of the indicator system are i) to extend the dataset with a focus on conservation measures, and ii) show the relative importance of the many variables so that it is clearer which variable(s) have the largest influence on the result. Such developments will allow better understanding of how large the effect of a technology must be to generate a difference, i.e. a decrease in risk. Some results of this evaluation were counterintuitive and deserve additional study. More detail can be found in **deliverable 4.4.1**.

8.5 Summary

The results of the field testing of SLM technologies selected through the DESIRE approach indicate that the process used - first assessing local conditions, then using a structured process to select SLM strategies based on the initial analysis and stakeholder input – leads to a high success rate for biophysical effects. The mostly socio-economic challenges raised in further stakeholder discussions are also a successful outcome in that this information is key to selection and effective implementation of the SLM practices that are most likely to be successful for the long term. Using the outcomes of the field trial results to evaluate the sensitivity and accuracy of the indicator system for desertification risk assessment resulted in some ideas for extension and refinement of the system.

9 Up-scaling SLM strategies

9.1 Introduction

Even when promising SLM strategies have been tested in field experiments, there remain many challenges to developing general recommendations for their use. Firstly, experimental conditions during field trials will always be limited and, as a result, cannot reflect the variable conditions within a region. For example, rains may have been so plentiful during the trial period that water conservation did not boost yields. Secondly, the time it takes for strategies to develop full effectiveness and deliver their full range of benefits is longer than they can be tested during the usual lifespan of a research project. For example, build up of soil organic matter after changing tillage methods or crop rotations is a slow process, and long-term yield increases will not have been observed. Finally, policy and decision makers would like to know whether a technology or approach performs across a range of conditions before supporting its implementation. Apart from differences in environmental conditions and the time it takes to develop full benefits, the investment costs and access to markets are important factors influencing the viability of an SLM strategy.

The challenge then is to evaluate the likely environmental effects of adopting different SLM strategies at a regional scale and assess their financial viability.

9.2 Aims and objectives

This penultimate step of the methodology has several main objectives:

1. Identify the likely environmental effects of the proposed SLM strategies.
2. Evaluate the financial viability of the selected SLM strategies.
3. Assess how different policy incentives might influence the uptake of strategies, and what the wider economic impacts of such policies might be.
4. Come to a conclusion as to what SLM strategies should be implemented where to achieve desertification policy targets at least cost.

9.3 Methodology

There are two phases to this methodological step. For the first stage, models are used as a tool to work with the environmental and socio-economic data. The information and outputs from this modelling is then presented, in the second stage, to stakeholders during a third and final workshop.

At the first stage, models are used to evaluate (i) the environmental and economic effects of the SLM strategies selected by stakeholders at both field and regional scales; (ii) potential policy scenarios; and (iii) global scenarios, for example about climate change and food security.

Within the DESIRE project, two interlinked modelling approaches were developed and applied[28]:

1. A **biophysical model**[29] was used to investigate the likely environmental effects of the selected SLM options. This model was an extension of the *PESERA model*, adapted to consider a wide range of SLM options and processes, for example forest fires and grazing.

---

[28] For more details on these models and their use, please see deliverable 5.4.2, available to download at http://www.desire-his.eu/, or the model descriptions on www.desire-his.eu/en/regional-remediation-strategies/model-descriptions

[29] This model is described in detail in Deliverable 5.1.2 "Improved Process Descriptions in the PESERA Model", available to download as above.

Adapted to each study site, the model was developed to closely reflect the indicators and land degradation drivers identified at earlier methodological steps. Model outputs were then used to look at the likely regional biophysical effects of different SLM options that had previously been trialled in study areas at a local (usually field) scale, to help formulate extension and policy recommendations.

2. The **DESMICE** (Desertification Mitigation Cost Effectiveness) **model** was used to evaluate the related socio-economic effects. This model was newly developed within the DESIRE project to scale up the economic assessment of SLM strategies from field to regional scale. To do this, it uses a spatially-explicit cost-benefit analysis. Taking the SLM strategies selected in stakeholder workshops in each study site as a starting point, DESMICE establishes how costs and value generated by those strategies change based on environmental conditions and things like distance to markets. Using the combination of biophysical and socio-economic modelling, it is possible to determine the field conditions in which different SLM strategies are likely to be most cost-effective and adoptable. Furthermore, DESMICE output can be tailored to stakeholder needs: from a land manager's perspective, it demonstrates spatially where each promising technology is likely to perform most efficiently; from a policy makers' perspective, analyses can be made to see how different policies might affect the viability of different strategies across a region, or help policy makers identify what environmental targets can be satisfied at what cost. Finally, DESMICE can be used to assess the cost-benefit effects of SLM strategies under global scenarios, e.g. to select the SLM technologies with the highest mitigating effect on land degradation, by comparing the costs and productivity the area would have for different SLM technologies.

This modelling method is novel because it incorporates inputs from multiple stakeholders in very different contexts into the modelling process, in order to enhance both the realism and relevance of outputs for policy and practice. Spatial Cost-Benefit Analysis is used to investigate the spatial variability of the profitability of SWC measures, which may have important implications for the adoption of measures across landscapes and their consequent environmental effects, and which can help to select those parts of the study sites where land degradation mitigation is both effective and profitable.

At the second stage of this methodological step, a third and final stakeholder workshop is also held to present and discuss the combined results from the models and field trials. Following a similar methodology as the preceding workshops (described in step II), this participatory process enables stakeholders to make a final selection of what technologies they consider to be worthwhile for dissemination, based on a combination of environmental, social and economic considerations. The information and stakeholder feedback gathered at this stage can go some way to formulating recommendations for extension and policy. If fed specifically to regional and/or national level policy makers, the hope is that they will create the boundary conditions (legislation, subsidies etc) that will enable stakeholders to actually implement the selected technologies.

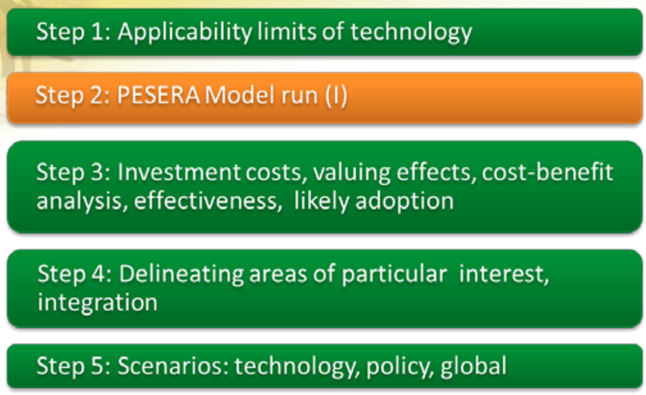


Figure 9-1 WB5 approach to modelling with PESERA/DESMICE.

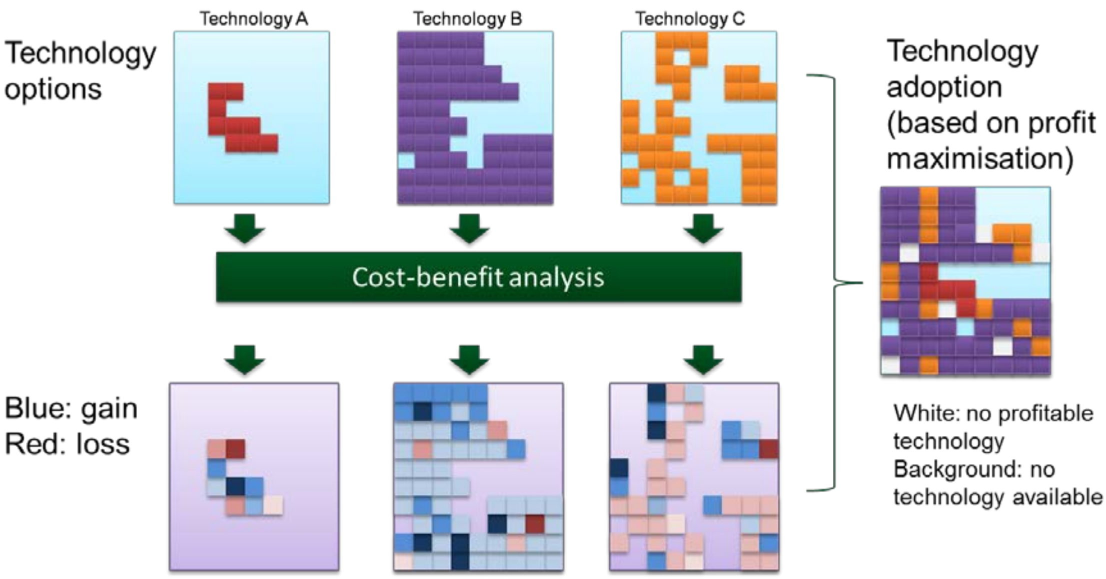
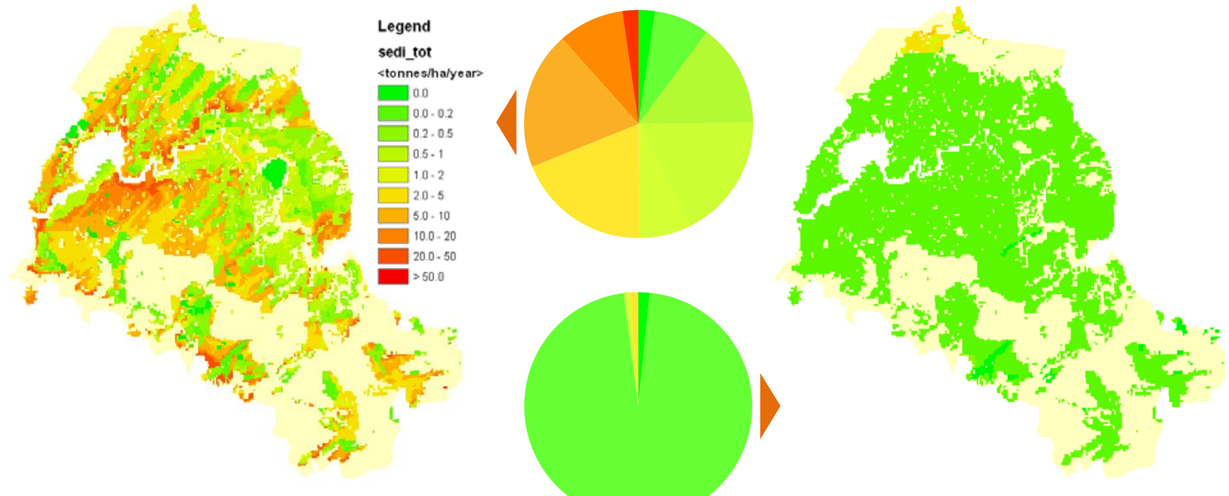


Figure 9-2 Cost benefit analysis in DESMICE.

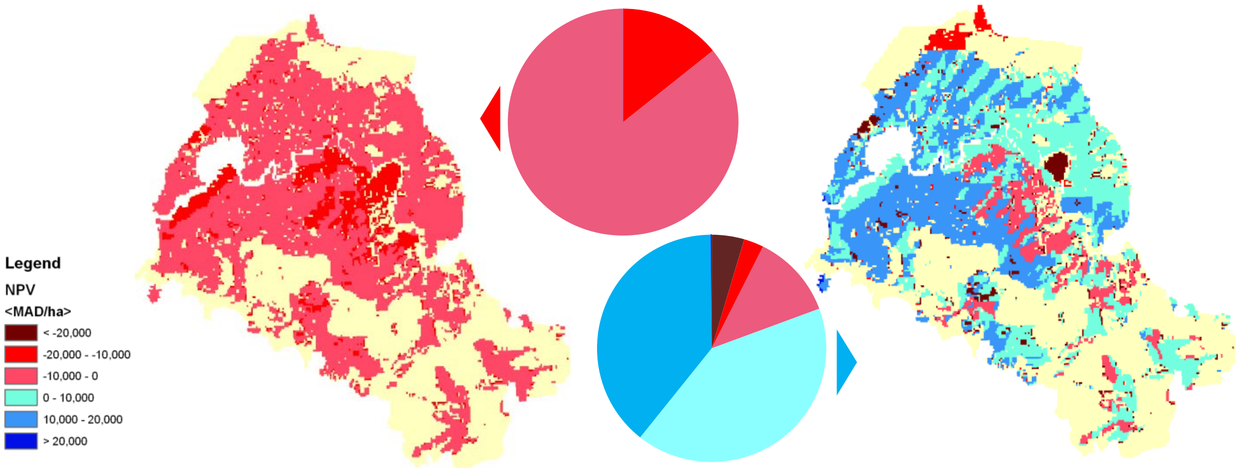
Biophysical impact: soil erosion



Without technology & Mulch only (MOR16A) **Mulch with direct seeding (MOR16B)**

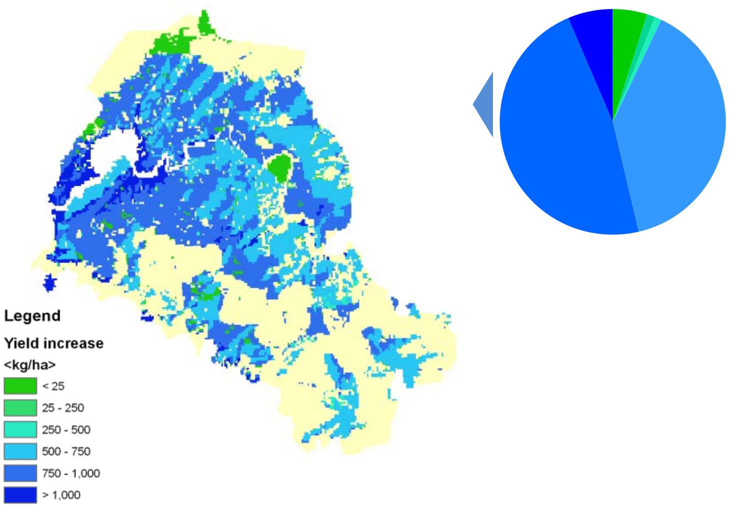
Economic viability

Net present value (10 years): Mulch only (MOR16A) **Mulch with direct seeding (MOR16B)**



Scope for increased production

Yield increase



- Yield increase in 99 % of applicable area
- Average absolute yield increase: 758 kg/ha
- Average yield increase: 181 %

Figure 9-3 Example from the Moroccan study site.

Scope for reduced erosion

- Reduction of erosion in 94 % of applicable area
- Average absolute erosion reduction: 3.93 tonnes/ha/yr
- Average percent erosion reduction: 95 %

Percentage of erosion reduction (negative values)

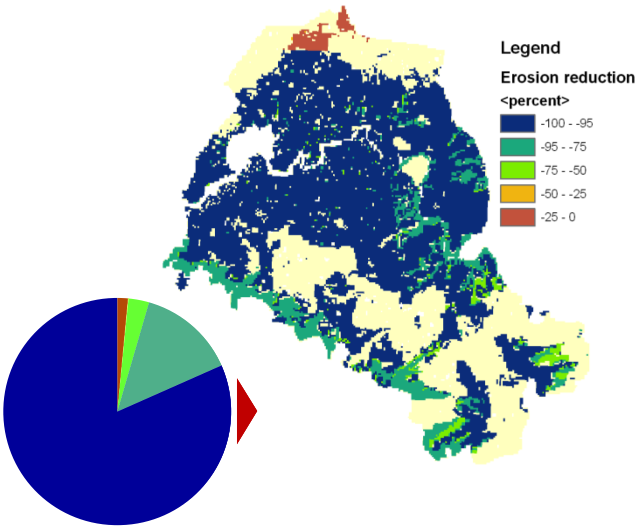


Figure 9-4 Example from the Moroccan study site.

Baseline assessments of soil erosion under current conditions were made for a range of study sites (Figure 9-5). Comparing these assessments, it becomes apparent that there are large differences between sites. PESERA results put the Seccano Interior (Chile) in first place regarding the severity of soil erosion, while Yanhe river basin (China) and Eskisehir (Turkey) also rank high. Cointzio (Mexico), Sehoul (Morocco) show a more mixed picture, with both pockets of unaffected and severely affected land. According to these results, the Torrealvilla (Spain) and Zeuss-Koutine (Tunisia) areas are only moderately affected by soil erosion. A comparison of these results with those of WOCAT mapping shows that there are striking similarities. The main differences seem to have to do with vegetation cover: in sites with little cover (e.g. Tunisia, Spain) , experts estimate erosion to be higher, while in site with high vegetation cover (e.g. Mexico) they estimate it lower.

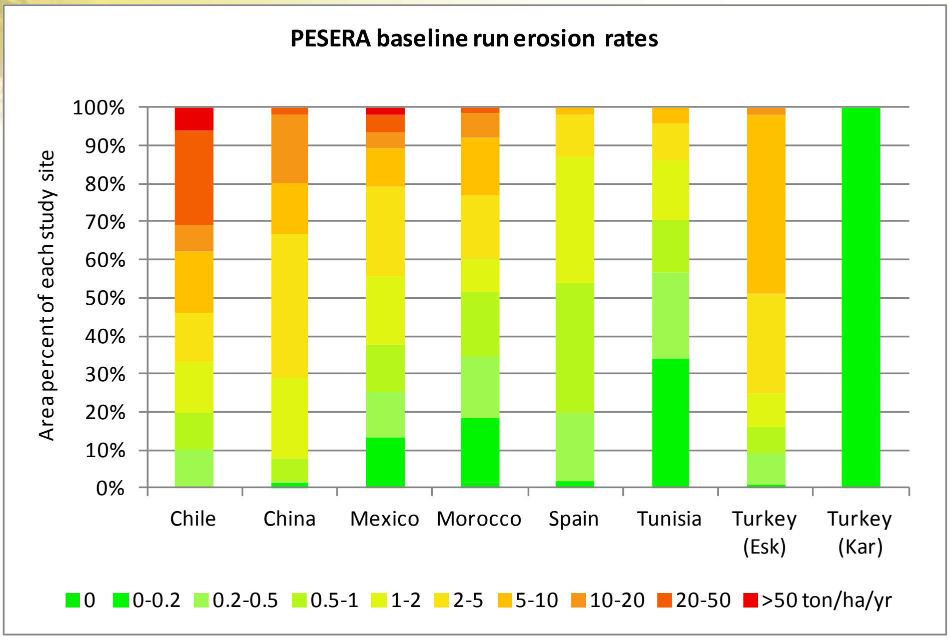


Figure 9-5 Overview of PESERA baseline run erosion rates for selected study sites.

The effectiveness and financial viability of a total of 22 technologies were simulated in the combined study sites. As Table 9-1 shows, structural measures (n=8) were the most common, followed by agronomic measures (7), management measures (5) and vegetative measures (2). In order to include technologies, availability of experimental data (WB4 experiments) was in many cases a requirement to understand the functioning and effectiveness of the technology and to calibrate PESERA to local site conditions.

Table 9-1 Overview of technologies in each study site for which PESERA-DESMICE simulations were run and their classification according to main WOCAT categories: agronomic, management, structural & vegetative.

Study site	Technology name	Type
Boteti, Botswana	Biogas (BOT05)	Management
Ribeira Seca, Cape Verde	Terraces with pigeon pea (CPV01)	Structural
Seccano Interior, Chile	No tillage with subsoiling (CHL01)	Agronomic
Yanhe river basin, China	Bench terraces with loess soil wall (CHN51)	Structural
	Checkdam for land (CHN52)	Structural
	Year-after-year terraced land (CHN53)	Structural
Cointzio, Mexico	Minimum tillage in rainfed and irrigated maize	Agronomic
	Land reclamation by agave forestry with native species (MEX02)	Vegetative
Sehoul, Morocco	Gully control by plantation of atriplex (MOR15)	Vegetative
	Mulching (fencing) and conventional tillage (MOR16A)	Management
	Mulching (fencing) and direct seeding (MOR16B)	Management
Góis, Portugal	Prescribed fire (POR02)	Management
Mação, Portugal	Primary strip network system for fuel management (POR01)	Structural
Torrealvilla, Spain	Reduced contour tillage in semi-arid environments (SPA01)	Agronomic
Zeuss-Koutine, Tunisia	Jessour (TUN09)	Structural
	Rangeland resting (TUN11)	Management
	Tabia (TUN12)	Structural
Eskişehir, Turkey	Contour ploughing (ETH43)	Agronomic
	Woven fences with contour ploughing (TUR05)	Structural
Karapinar, Turkey	Minimum tillage	Agronomic
	Stubble fallowing	Agronomic
	Ploughed stubble fallowing	Agronomic

When classifying the simulated technologies according to the type of measure, a gradient of increasing cost of investment can be observed going from Agronomic < Management < Structural measures ≈ Vegetative. Agronomic measures were very cheap and in one case actually presented a cost saving (range -€30 - €79 per ha); they can be incorporated in the annual crop production cycle and are confined to application on arable land. Management measures are more versatile and included a variety of technologies ranging from biogas to prescribed fire for fire prevention and controlling access to fields or rangelands. They typically command an investment analysis as benefits tend to accrue in the medium to long term. The same holds for structural measures.

Within applicable areas, many technologies are not profitable in about 70% of the area. Yields may not respond or even be negatively affected, rendering the technology uneconomic despite low cost. For management measures, their versatile nature makes that although they are widely applicable, they are not universally financially sustainable. Together with structural measures, another factor with large influence is the time horizon after which the technology is evaluated. Some examples are included of measures that are not profitable after 10 years, but very profitable after 20 years. For structural measures, another factor that contributes to mixed financial performance is their sometimes very high investment cost.

A total of 11 policy scenarios were run for 8 different sites. The first question we can ask is whether policies contributed to the aim to facilitate upscaling of desertification remediation options. Figure 9-6 shows a large spread in feasibility of technologies under situations with and without policy interventions. The 1:1 line is the no-effect line and usually one expects only the area above the line to be populated; the larger the distance to this line the more effective a policy is. The chart shows that in a few instances, policies do not result in increased feasibility. On two occasions, there are slight improvements of an already quite high feasibility, e.g. from 81 to 93%. In the remaining cases, an unprofitable technology is raised to being feasible in between 33 and 94% of the applicable area.

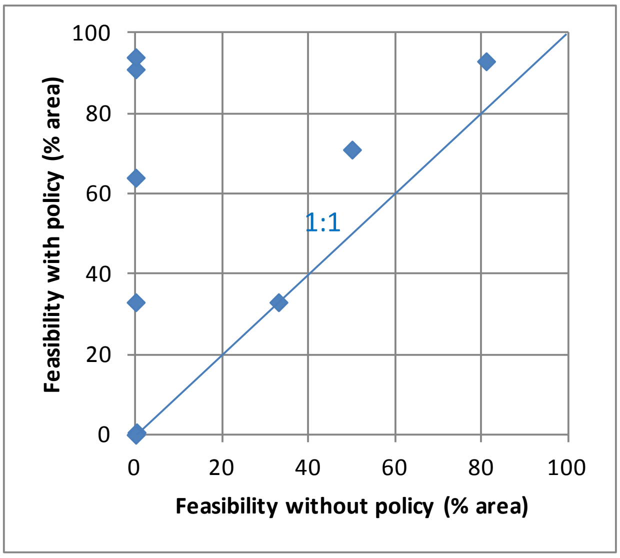


Figure 9-6 Effectiveness of policy scenarios on feasibility of technologies.

Figure 9-7 and Figure 9-8 respectively show results of cross-site analyses of opportunities for increased food production and reduced soil erosion. Turning first to the food production scenario, average potential yield increase ranges from less than 50 kg/ha to more than 3000 kg/ha (Figure 9-7A). However, in three quarters of the study sites, productivity can increase by more than 500 kg/ha. In half of the cases where increased food production is possible, improvements can cover the lion share of the applicability area (Figure 9-7B). In all sites, yield increases can be obtained in more than 20% of the applicable area. The investment costs required to achieve this are substantial when looking at the first year (Figure 9-7C, n=12, average cost €567/ton when one case with 'cost' below zero is excluded), but are reduced when aggregating over the economic life of technologies (Figure 9-7D, n=9, average cost €145/ton).

Opportunities to reduce land degradation exist universally across applicability areas: at minimum, soil can be conserved by the technologies assessed on 70% of the applicable area. The rate by which soil loss can be reduced is either very high (80-100%) or moderate (0-40% reduction). In some cases, there are no additional costs involved to reduce soil loss, in others substantial investments (>€1000/ton) need to be made if analyses are done on a single year of erosion reduction. When spread out over the lifetime of technologies, erosion reduction becomes much more affordable, at rates often below €250/ton and in a considerable number of cases below €100/ton.

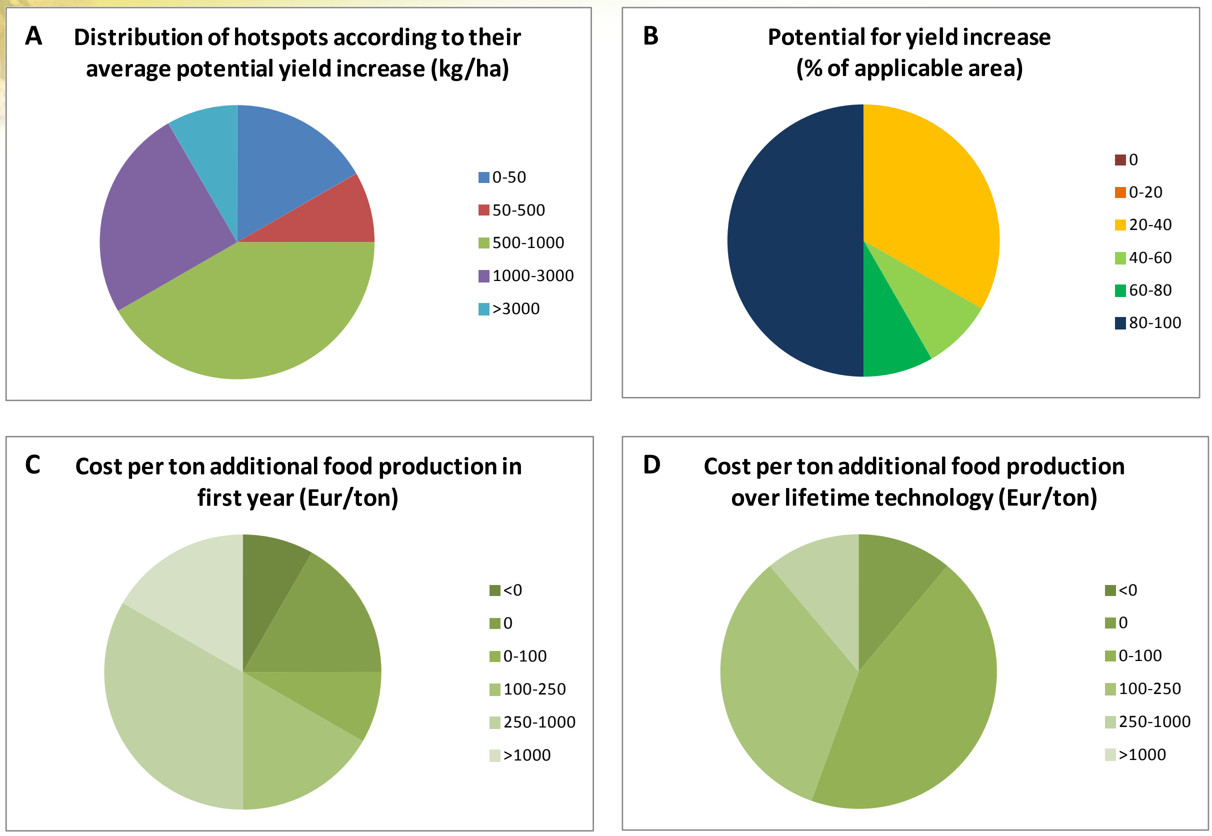


Figure 9-7 A-D: Results for cross-site comparison of food production scenario.

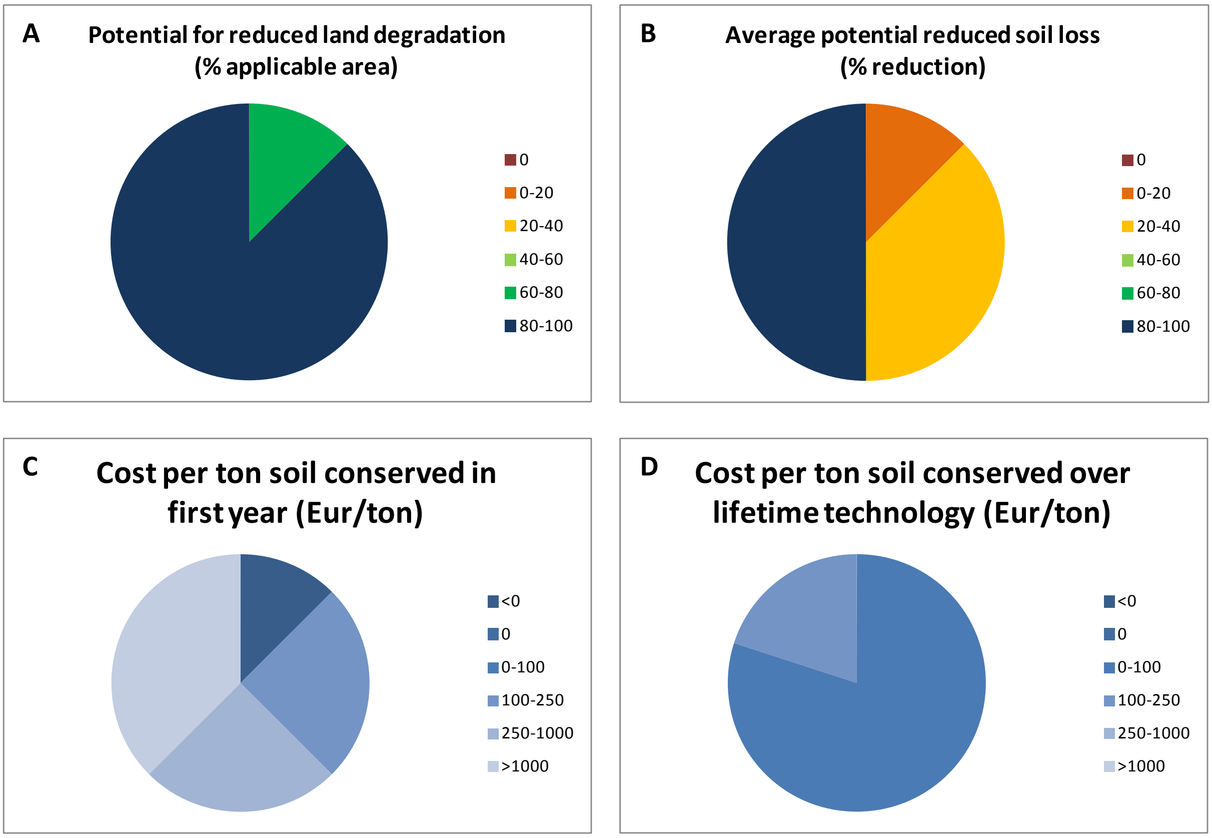


Figure 9-8 A-D: Results for cross-site comparison of minimizing land degradation scenario.

Table 9-2 summarises the modelling results obtained with PESERA/DESMICE modelling. This table shows that most technologies had a positive effect on bio-physics; either by decreasing degradation or by increasing yield. Conversely, most technologies showed a negative effect on socio-economics, usually because of the costs associated with implementing the technology.

Results of monitoring and modeling were presented to stakeholders during the last stakeholder workshop. Based on these results, the stakeholder made a final ranking of technologies (Table 9-3) that would be suitable to apply, and for which information should be disseminated to other stakeholders, including policy makers.

9.4 Concluding remarks

The main findings were that (simple) technological options exist that can minimize land degradation and increase food production. However, a major bottleneck for adoption is financial viability and investment cost. Low cost agronomic measures and other options that deliver important benefits in the short term are the preferred technologies. Stakeholder evaluation and model output mostly concur. For larger (more expensive) technologies feasibility studies will need to be done on a case by case basis.

Table 9-2 Effectiveness of scenarios -- = strongly negative, - = negative, 0=neutral, + = positive, ++ = highly positive; BF = bio-physical effects, SO = socio-economic effects.

Site	Technology scenario							
		BF				SO		
		Applicability[30]	Degradation[31]	Yield[32]	Overall	Profitability area[33]	Profitability rate[34]	Overall
Spain	Reduced tillage	-	+	-	0	-	--	-
Portugal (Gois)	Prescribed fire	na	+	+	+	--	--	--
Portugal (Macao)	Fuel strip network	na	-	+	0	na	0	0
Italy								
Greece (Crete)								
Greece (Nestos)								
Turkey (Karapinar)	Minimum tillage	+	0	-	0	-	0	-
	Stubble fallowing	+	0	-	0	-	0	-
	Ploughed stubble fallowing	+	0	-	0	-	0	-
Turkey (Eskisehir)	Contour ploughing	-	-	++	0	++	++	++
	Woven fences	-	-	++	0	--	--	--
Morocco	Atriplex	--	++	++	+	++	0	+
	Mulch + conv till	+	-	-	0	--	--	--
	Mulch + direct seeding	+	++	++	++	++	-	+
Tunisia	Jessour	-	+	++	+	--	--	--
	Rangeland resting	++	0	++	+	--	--	--
	Tabia	++	+	++	++	+	-	0

---

[30] --: *0-20%; -:20-30%; 0:30-40%; +:40-50%; ++:>50%*

[31] Based on change of erosion class from without situation to technology situation: --: *red to red; -:red to yellow, yellow to yellow; 0:yellow to olive, olive to olive, green to green; +:red to olive, yellow to green, olive to green; ++:red to green*

[32] *--:<0%; -:0-10%; 0:10-25%; +:25-100%; ++:>100%*

[33] *--:0-20%; -:20-40%; 0:40-60%; +:60-80%; ++:>80%*

[34] *NPV divided by investment cost for the area where NPV > 0: --: 0-1; -:1-2; 0:2-3; +:3-4; ++:>4*

Russia (Djanybek)								
Russia (Novij)								
China	Bench terraces	++	++	++	++	0	-	-
	Checkdam for land	--	-- (downstream +!)	+	-	0 (50% 1:1/50% 1:3)	--	-
	Year-after-year terraces	++	+	++	+	++	+	+
Botswana								
Mexico	Agave	-	+	++	+	++	++	++
	Minimum tillage	+	-	-	0	+	++	+
Chile	No tillage with subsoiling	-	-	+	0	++	-	0
Cape Verde	Terraces with pigeon pea	++	0	++	+	--	0	-

Table 9-3 Remediation options as selected by stakeholders prior to field trials and after being presented with results from field trials and models.

Study Site	Selected for trials	Priority order post-results	Comments
Cape Verde	1. Afforestation 2. Vegetative barriers	1 Vegetative bunds on steep rainfed arable fields, and vegetation spread across non-sloping fields	Only afforestation and vegetative barriers were evaluated. Vegetative barriers were adapted in response to field trial results
Mexico	1. Agronomical strategies 2. Wood saver ovens 3. Run-off control in gullies	1. Agave forestry sustainable plantations with native plants 1. Wood saver ovens 2. Agronomical strategies 3. Spatially targeted run-off control in gullies	Agave plantations emerged as a new option during field trials
Spain	1. Traditional water harvesting (Boquera) 2. Reduced tillage in Cereal and Almond fields 3. Organic mulch to reduce water losses 4. Green manure in Almonds orchards	1. Green manure in Almonds orchards 2. Reduced tillage in Cereal and Almond fields 3. Traditional water harvesting (Boquera) 4. Organic mulch to reduce water losses	
Turkey (Karapinar)	1. No-till technology 2. Caragana korschinskii planting	1. Fallow with stubble farming 2. Fallow without stubble farming 3. Minimum tillage	No-tillage was adapted as minimum tillage for field trials, and stubble farming was
Turkey (Eskişehir)	1. Planted soil bunds 2. Stone bunds 3. Fanya juu terraces 4. Caragana korschinskii planting	1. Wooden fences with soil bund 2. Contour tillage	Vegetation and stones were replaced by fencing on soil bunds for field trials. Contour tillage was discussed but not ranked during selection workshop
Chile	1. No tillage with subsoiling 2. Agroforestry systems 3. Crop rotation with legumes	1. No tillage with subsoiling 2. Crop rotation with legumes 3. Agroforestry systems	
China	1. Reforestation 2. Terraces	1. Reforestation 2. Terraces	
Portugal	1. Primary Strip Network System for Fuel Management 2. Prescribed Fire	1. Primary Strip Network System for Fuel Management 2. Prescribed Fire	
Tunisia	1. Tabia and jessour 2. Flood spreading & recharge units 3. Cisterns	1. Flood spreading & recharge units 1. Supplement irrigation 2. Medicinal herbal and aromatic plants 2. Cisterns	
Greece (Nestos)	1. Fresh water transport	1. Fresh water transport	

Greece (Crete)	Messara area: 1. Sustainable grazing Chania area: 1. No tillage 2. Pesticides 3. Tillage	1. Sustainable grazing	The team worked in two areas – one prioritised no-tillage and the other sustainable grazing. The majority of workshop participants came from the location that had prioritised sustainable grazing, and so no-tillage was not explicitly evaluated during the workshop
Morocco	1. Vegetative strips 2. Treatment of gullies	1. Cereal/leguminous system mixed with trees; and runoff water harvesting, in order to improve the production and restore the lands fertility 2. Protection of existing grazing lands, forests and former cultivated areas 3. Treatment of gullies	
Botswana	1. Game ranching 2. Biogas production 3. Rainwater harvesting 4. Solar cookers	1. Biogas production	Biogas production was the only remediation strategy that was trialled in this study site
Russia (Novy)	1. Drip irrigation	1. Drip irrigation 2. Green manure 3. Drainage of irrigated agricultural fields 4. Phytoreclamation of soil secondary salinity at agricultural fields	
Russia (Dzhanybek)	1. Drip irrigation	1. Drip irrigation 2. Impermeability of the bed of water storage capacities	

10 Communication and dissemination

10.1 Introduction

From the very start of the DESIRE project, communicating key messages to a wide range of stakeholders was a priority. This was the main focus of WB6, and involved all project partners. Throughout the project groups and individuals at many different levels were consciously addressed, from land users and teachers, to policy makers at local, national and global levels. A primary objective of this aspect of DESIRE was to ensure availability of the project generated information beyond the boundaries and lifetime of the project.

10.2 Goals and objectives

The main communication and dissemination goals were:

- To disseminate research outcomes to all relevant stakeholders, and
- To develop a group of researchers well trained in research dissemination.

This involved identifying different audiences, tailoring communication materials to those audiences, delivering them in the most appropriate ways, providing dissemination training to all members of the project team and production of a an extensive Manual of Communication and Dissemination.

Regarding dissemination to all relevant stakeholders, the most important objectives have been:

- To develop and populate a Harmonised Information System (HIS) http://www.desire-his.eu/ on the DESIRE website as the centre for comprehensively archiving, documenting and giving access to all the material collected, organized, and developed in DESIRE

- To disseminate results and material from other work blocks as it became available, so that all partners and stakeholders could access the information
- To make the web-based HIS suitable for a broad range of users by making materials available in various formats and languages
- To explore a wide range of opportunities, within the HIS and with stakeholders, to present and disseminate information and “best management practices”, as determined by research and testing in the study sites
- To disseminate the DESIRE products to the international community, through newsletters, meetings and conferences, as well as through the DESIRE information system and website

10.3 Strategies, materials, methods and outputs

A brief review of the strategies, materials, methods and outputs for achieving the communication and dissemination goals of DESIRE are presented below. More detailed information can be found in **deliverable 6.3.2** and on the DESIRE Harmonized Information System website (www.desire-his.eu)

DESIRE Website and Harmonised Information System (HIS)

The DESIRE Project has been an innovator in using a wide range of dissemination opportunities. Many projects have a website, but DESIRE also has an online Harmonised Information System that houses all the visual results from the project.

The main DESIRE website (www.desire-project.eu) was created at the start of the programme. This includes a public information face and administrative and procedural information for DESIRE project partners (Figure 10-1).

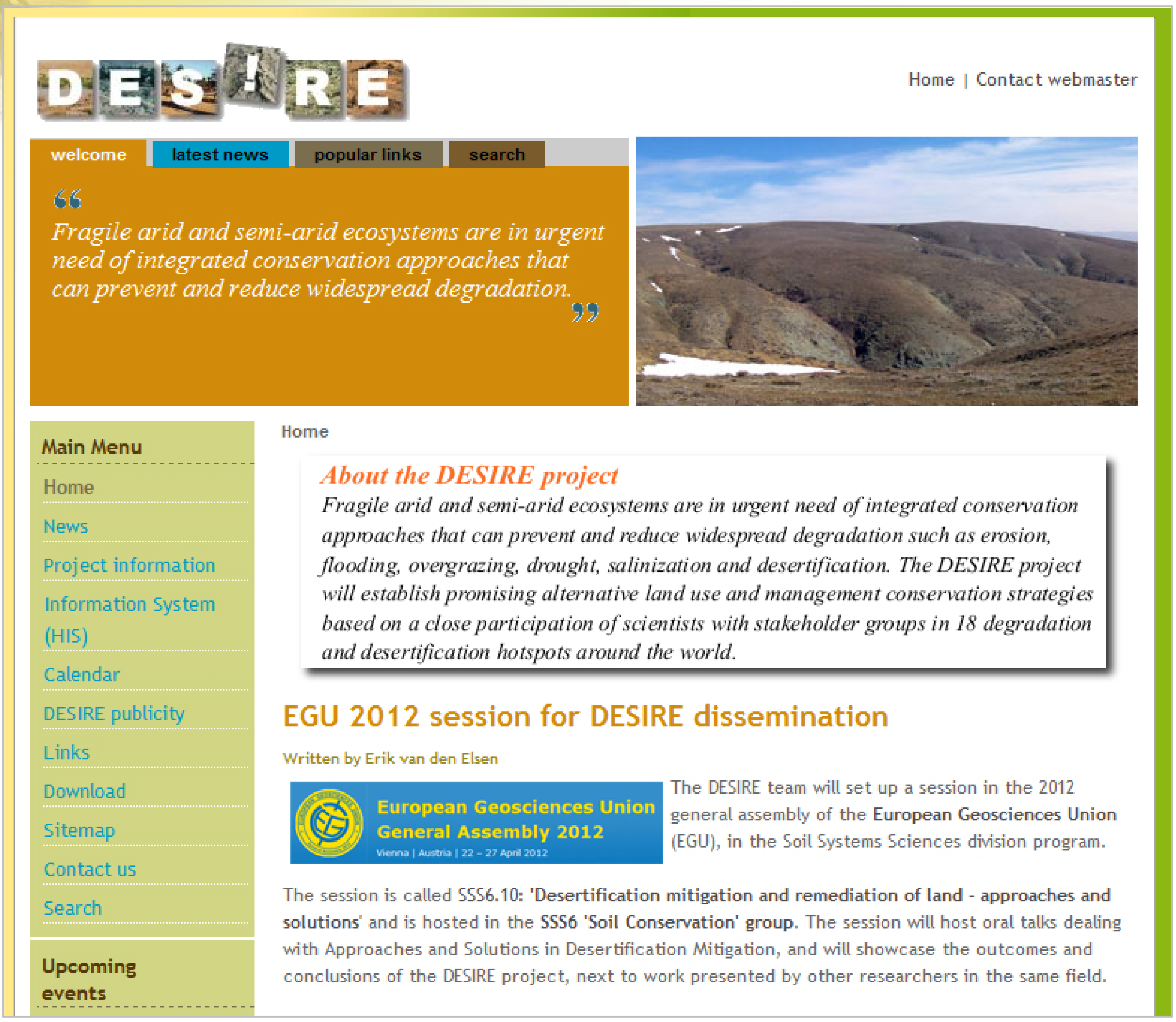


Figure 10-1 Homepage of the DESIRE website (www.desire-project.eu).

The Harmonised Information System (HIS) (www.desire-his.eu) was set up on the DESIRE website in the first six months of the project. It has been updated regularly throughout the project and is open for public access (Figure 10-2). The HIS is a unique dissemination tool to provide information about the DESIRE Project in a full range of complexity and detail, with material also designed so that it can be printed off for those who do not have access to computers or the internet. Those who require only summarised or simple pictorial information may read the introductions on the web pages. Video clips and podcasts are also included. Those who need more detail, greater complexity, are directed to various downloadable products. The HIS is organised so that results may be accessed according to both the research themes and by individual study sites. A PowerPoint presentation describing the features of the HIS has also been prepared. The HIS is the principal dissemination tool for the DESIRE project.

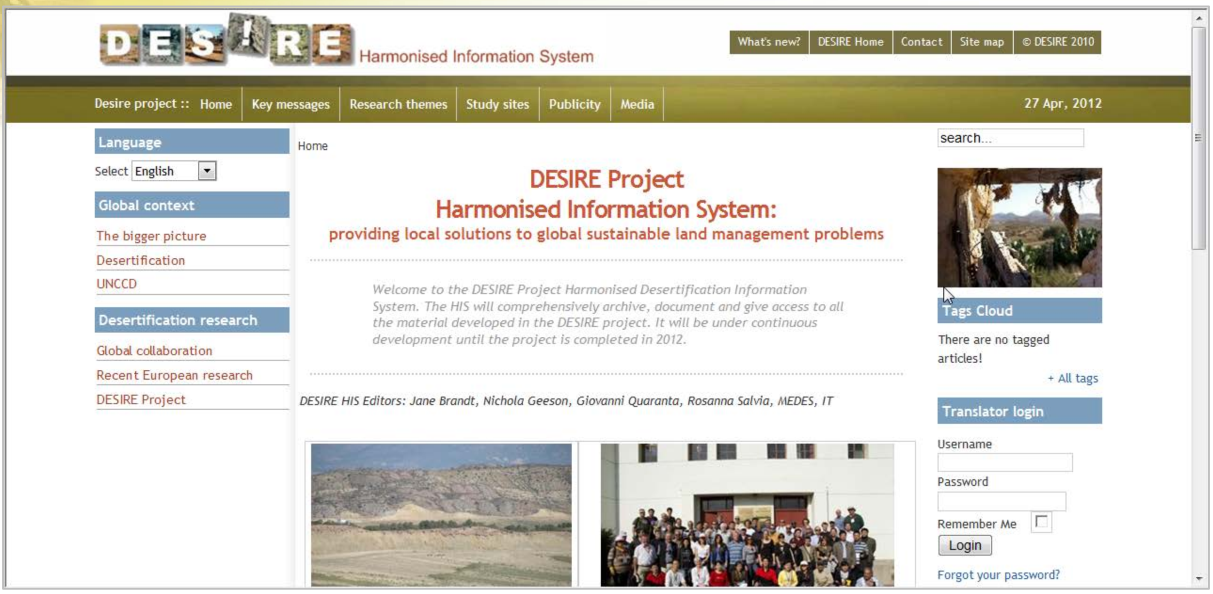


Figure 10-2 The Home page of the HIS with access to the main menus: Home, Key messages, Research themes, Study Sites, and Media.

Training and Communication and Dissemination Guide

Successful dissemination also relies on effective training for research partners. This was achieved through sessions at plenary meetings and also with information documents. In particular the **Manual of Communication and Dissemination**[35] was compiled to provide a comprehensive reference source.

The Manual of Communication and Dissemination provides "Guidance for organisation of community work, writing dissemination products, and dissemination activities". The Manual was first prepared in Year 2 of the project, then updated in Years 4 and 5. Sections include: writing dissemination products, facilitation and participatory methods, communication and network building, and examples of ideas for dissemination products, such as video clips. A generic version of this Manual, that could offer support to similar future projects was also completed and is available on the HIS.

[35] Downloadable from the HIS at: http://www.desire-his.eu/en/disseminating-results/guidance

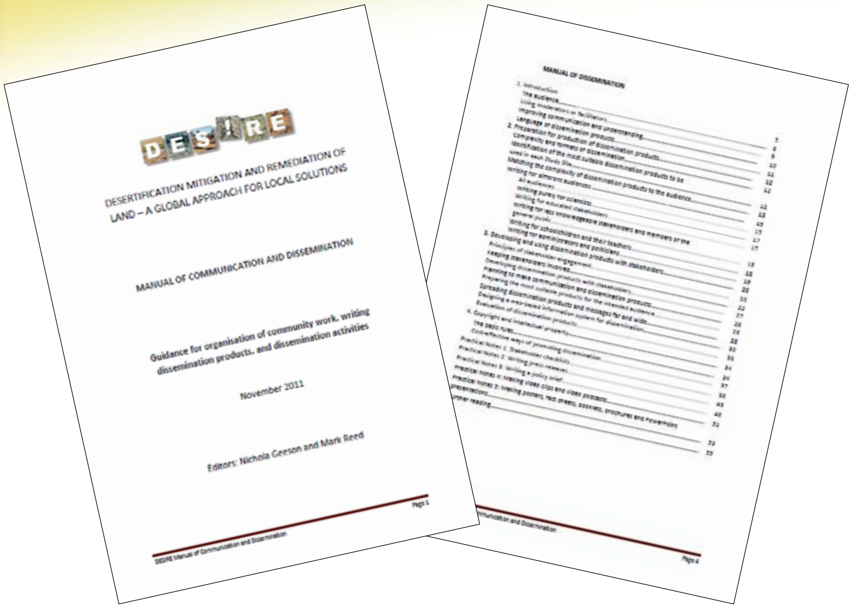


Figure 10-3 DESIRE Manual of Communication and Dissemination

Training sessions at plenary meetings addressed various topics related to communication and dissemination strategies and methods. Guidance materials including a video of the dissemination training session held in Xi'an, China, October, 2010 are available in the Facilitating dissemination section under Research Themes on the DESIRE HIS.

The following 8 steps for development of effective dissemination products were used and taught the DESIRE project communication activities:

1. Identify the range of stakeholder groups and key stakeholder groups
2. Identify the complexity of information required by key stakeholder groups (ideally by asking the stakeholders directly)
3. Identify the ideal formats for information suitable for key stakeholder groups
4. Choose the most relevant from all the Messages coming out of the research, to address the particular stakeholders
5. Assemble Packages of information from available material and products coming out of research, and adapt this material for specific stakeholder groups
6. Determine what needs to be translated into the local language
7. Determine the best ways (participatory methods) for dissemination to happen, e.g. exhibitions, community events, social events, conferences, TV interviews, podcasts, videos, DVDs, other written material, etc.
8. Plan time tables to put the plans into action.

Range and types of products

In order to accomplish DESIRE's goals and objectives for dissemination, a wide range of information products was needed. Table 10-1 shows the types of dissemination related products produced during the course of the project. While the primary responsibility of a particular partner, many of the varied products were the combined work of more than one DESIRE partner.

Some of these results were disseminated directly while others were edited, or re-organised, into a variety of new products. Most products are available either on the HIS or on linked websites. Products are available in different formats, at different levels of complexity, in different languages, as downloadable documents, etc. as appropriate. The material may also provide the subject matter for videos, video-clips, films and other presentations.

Table 10-1 Examples of Training and Dissemination Products available from DESIRE– February 2012. WB: work block.

WB	Product	Main User
	DESIRE Project website	All, general
	DESIRE brochure	All, general
	DESIRE video	All, general
	DESIRE poster series (overall aims etc.)	All, Study Sites
	Book: Desire for Greener Land	All, general
6	Harmonised Information System on DESIRE website	All, general
1	Scientific review of desertification issues	Scientists
2	Indicator manual	Study Sites
3	WOCAT training manuals and decision support tool	Study Sites
4	Monitoring manual	Study Sites
5	Modelling framework	Scientists
6	Manual of Communication and Dissemination	DESIRE
6	Manual of Communication and Dissemination (generic)	All, general
6	DESIRE Newsletters	All, general
6	DESIRE Factsheets	All, general
6	DESIRE general policy briefs and info-briefs	All, general
6	Communication and dissemination training video	All, DESIRE
NGOs	3 Factsheets on stakeholder participation (NGO & WB6)	All, general
NGOs	Policy briefs for each study site	All, general
	Newsletters within individual study sites, e.g. Spain, Chile	Stakeholders and policy makers

Diversity of channels and media for dissemination

As they became available DESIRE dissemination products were circulated to over 200 DESIRE contacts/subscribers, plus circulation through environmental email circulation lists such as LAND-L. They were also advertised on the DESIRE website, and in items for widely-read environmental newsletters such as Desert Net International and Land Scan. Using the email circulation lists prepared for Deliverable 6.3.1 in year 2, all study site partners have been encouraged to translate DESIRE products into their own language if appropriate, and circulate them.

All partners were also encouraged to use local media to advertise the results of the DESIRE Project. This was successful in a number of cases, e.g. the La Voz de Almeria newspaper (Spain) reported on the DESIRE plenary meeting in October 2011 (Figure 10-4). There was also quite a lot of media coverage in Chile, Greece, the Netherlands, Portugal and Turkey.

26 empresas LA VOZ DE ALMERIA JUEVES, 6 DE OCTUBRE DE 2011

AGRICULTURA

Logran un aumento del 40% en la producción de almendra con abono verde

La Estación de Zonas Áridas consigue aunar producción y sostenibilidad en un cultivo experimental de secano

ALICIA AMATE
REDACCIÓN

Aunar producción y sostenibili-

De este modo, tras diferentes encuentros, agentes locales e in- vestigadores determinaron las

Figure 10-4 La Voz de Almeria newspaper (Spain) report on the DESIRE plenary meeting in October 2011.

Another regular channel for dissemination was in association with various UNCCD events. The brief “The idea of sustainable development and what it means for zero net-growth in degradation” supported the UNCCD at COP10 in October 2011 and at Land day 5 in Durban in December 2011, and featured on the front page of the UNCCD website in December 2011. A press release for Desertification Day, 17 June 2011 was entitled “Let’s plant more trees in drylands - DESIRE shows how forests help to avoid desertification”.

Information in addition to the DESIRE publications was also provided to various global newsletters on desertification, for example the DesertNet International newsletter and the UNCCD’s Land Scan. And in order to have information on DESIRE be available to an even wider public, one project partner has set up a DESIRE Twitter stream to advertise DESIRE publications (www.twitter.com/DESIREproject).

Presentations at International conferences

The progress of DESIRE has been presented at many conferences and meetings throughout the 5 years.

- Some conferences have furthered knowledge between scientists on a global scale, e.g. the annual European Geosciences Union (EGU) General Assembly in Vienna;
- Some have focussed on more specific subject matter, e.g. geomorphological processes at LANDCON, X’ian, China, October 2010.
- Other conferences have involved a wider audience: of scientists with SMEs, NGOs and policy makers. For example, Partners have represented DESIRE at the first UNCCD CST Scientific Conference, ‘Understanding Desertification and Land Degradation Trends’ held at COP-9, 22-24 September, 2009 in Buenos Aires, Argentina, and at UNCCD COP10, October 2011.
- Further information on the range of conferences can be found in **Deliverable 6.3.3.**

Impact of trial results

Trial results

Results from the many field trials needed to be disseminated to all relevant stakeholders. To facilitate this consistent format was developed and 3-5 page summaries were produced for each technology tested at each site. These summaries are formatted and written to be easily read by non-experts, to improve their usefulness and go beyond the immediate scientific results. (See chapter 8 for more information.)

Study site policy briefs

The NGO partners CARI and BothEnds were responsible for coordinating and finalising policy briefs from each study site (Figure 10-5). The policy briefs were to be used to draw attention to DESIRE research with policy makers at a range of spatial scales from local to national. The following policy briefs were produced.

- Policy Brief Portugal (Partner 7) - Results from Desire Project, a global initiative to combat desertification. In English and Portuguese.
- Policy Brief Crete (Partner 9) – Sustainable grazing protects against soil erosion.
- Policy brief Eskisehir (Partner 10) – Wooden fences protect against soil erosion
- Policy brief Karapinar (Partner 10) – Stubble farming increases yield in wheat cropping in central Anatolia
- Policy brief Tunisia (Partner 12) - La mise en repos des terres de parcours dans les zones arides de Tunisie : Une stratégie doublement gagnante pour les éleveurs et pour le territoire; Rangeland resting for improving grazing lands in the dry areas of Tunisia
- Policy brief China (Partner 13) – Three ways to reduce soil erosion
- Policy brief Botswana (Partner 20) – Land users and public institutions switching to biogas
- Policy brief Mexico (Partner 22) - Population, sciences et politiques publiques : Une alliance gagnante pour protéger les ressources naturelles, les services qu'elles rendent et… les populations qui y vivent
- Policy brief Chile (Partner 27) - Fighting against soil erosion and improving the sustainability of Mediterranean rainfed agriculture
- Policy brief Cape Verde (Partner 28) - Le croisement entre le savoir-faire des paysans et la connaissance scientifique contre la désertification.

Figure 10-5 DESIRE Policy Brief with recommendations (Chile)

Gender activities

Throughout the DESIRE project consideration was given discussion of and communication about the role of women in research and for stakeholder involvement. Workshops and other activities were designed to allow women an equal contribution. Partners were asked to respond to a Gender Questionnaire annually, and in October 2009 study site leaders prepared posters to illustrate advances in gender equality in their study sites. These posters were used in the study areas and are available on the DESIRE – HIS site.

Publications and

All DESIRE partners have prepared scientific papers[36]. Of particular interest were the multi-author papers arising from the UNCCD's White Papers from COP 9 in 2009. These later became part of a special issue of Land Degradation and Development[37]. Most DESIRE partners also contributed to:

- The DESIRE-WOCAT book: Desire for greener land: options for sustainable land management in dryland (Schwilch et al., in press)[38].
- Special issues of journals featuring DESIRE research papers. Three special issues are planned: **CATENA**, Desertification assessment, processes and mitigation (12 papers); **Environmental Management**, Preventing and remediating desertification: an integrated participatory, monitoring and modelling approach to derive feasible solutions (15 papers); **Land degradation and development**, Socio-economic and policy aspects of desertification and land degradation.

---

[36] A list of publications is included in Deliverable 6.3.2.
[37] [37] Reed MS, Fazey I, Stringer LC, Raymond CM, Akhtar-Schuster M, Begni G, Bigas H, Brehm S, Briggs J, Bryce R, Buckmaster S, Chanda R, Davies J, Diez E, Essahli W, Evely A, Geeson N, Hartmann I, Holden J, Hubacek K, Ioris I, Kruger B, Laureano P, Phillipson J, Prell C, Quinn CH, Reeves AD, Seely M, Thomas R, van der Werff Ten Bosch MJ, Vergunst P, Wagner L (2011) Knowledge management for land degradation monitoring and assessment: an analysis of contemporary thinking. Land Degradation & Development.
[38] Schwilch et al. (200) (Eds.)Desire for Greener Land. Options for Sustainable Land Management in Drylands. CDE, Alterra, Wageningen UR and ISRIC World Soil Information. In press.

10.4 Conclusion

The DESIRE Project has sought and used a huge array of opportunities for dissemination. The HIS is an innovative use of a website to record the whole story of the development and results of research, that will stay available for a substantial period after the end of the Project, at the courtesy of Alterra, Wageningen UR. In this way DESIRE has reached, and will continue to reach, a very wide range of end users. There is a good chance that some of these end users will have the means, in terms of power and finance, to use the results and information to take effective action on land degradation and desertification in drylands. Data files from all partners are also being archived at Alterra, Wageningen UR, The Netherlands.

Outcomes of step 5 – Communication and dissemination

The resulting output takes many forms from simple posters and info sheets, to videos (vimeo.com/19738629), technical reports, policy briefs and step by step guidelines. A key DESIRE dissemination output is the comprehensive manual of communication and dissemination, supported by practical advice and PowerPoint presentations. The manual provides guidelines for continuing knowledge sharing and building networks with stakeholders, and ideas for effective dissemination of project outputs to stakeholders inside and outside the project. This and all other output and findings from the DESIRE project are freely available on the DESIRE-HIS website.

Information on the DESIRE approach and outcomes has been shared with organizations concerned with land degradation and presented at conferences and in journals worldwide. In addition, various national and international governmental bodies have embraced the methodological framework developed through the DESIRE-WOCAT collaboration, e.g. it has been incorporated in publications and initiatives by the United Nations Convention to Combat Desertification (UNCCD), the UN Food and Agriculture Organisation (FAO), and the Global Environment Facility (GEF).

The WOCAT databases and tools, updated with the results from the DESIRE project, and the DESIRE approach have also been compiled in the book 'Desire for Greener Land' (publication summer 2012), and are available worldwide online through www.desire-his.eu and www.wocat.net. Scientific innovations are due to be published in three special issues of international journals (Environmental Management, Catena and Land Degradation and Development).

11 Impacts

The DESIRE IP was designed to develop recommendations for the prevention and remediation of desertification on the basis of the latest scientific achievements, cross-linked with local available knowledge. The project provides a fully integrated approach to deal with land degradation and desertification problems at local and regional scales, by interacting with a variety of stakeholders using advanced participatory, monitoring, and modelling techniques. The research outputs serve audiences at various levels ranging from the scientific community to practitioners, agricultural extensionists, authorities, policy makers, NGOs, land users, land owners, and local communities. DESIRE has provided guidelines, recommendations and tools that directly link research findings into feasible management actions.

DESIRE also has a indirect impact on a wide range of societal and economic issues, including i) the Quality of life, health and safety through integration of effective management tools that reduce degradation and desertification of fragile ecosystems and the impact of Global Change and related risks, including enhancement of livelihood conditions, and ii) the Environment in ensuring a sustainable land and water management and the maintenance of biodiversity. In doing so, DESIRE has responded to the strategic objectives of the 10-year strategic plan for 2008-2018 to enhance the implementation of the United Nation Convention to Combat Desertification (UNCCD).

PART III DISSEMINATION AND USE

12 Final plan for using and disseminating the knowledge

The DESIRE project has established promising alternative land use and management conservation strategies based on a close participation of scientists with stakeholder groups in desertification hotspots around the world. The project results have been translated to a series of practical guidelines for environmental management, which have been (and still are) disseminated to practitioners, agricultural extensionists, policy makers, NGOs, land users, land owners, and local communities, both via internet (HIS) and as hardcopies of manuals, booklets, and leaflets in the appropriate languages. Local facilitators have been trained by DESIRE scientists to bridge the gap between scientists and non-scientific product users, and training packages were developed. All DESIRE products and training material are downloadable from within the HIS so that their use can be adapted in new locations for new purposes. In addition, the developed land management strategies have been added to the WOCAT databases.

This project has developed a widely transferable methodological approach that can combine bottom-up and top-down approaches to degradation monitoring and remediation, using a range of qualitative and quantitative tools. This so called DESIRE-approach provides scientifically robust research outputs that are relevant for people who face the challenges of land degradation, and that enable us to deliver remediation strategies that are scientifically sound as well as socially acceptable.

12.1 Section 1 - Exploitable knowledge and its use

Not applicable.

12.2 Section 2 - Dissemination of knowledge

Dissemination activities during the project

During the fifth project year, a large number of dissemination activities have been performed. DESIRE aims to provide information at three levels of complexity: for scientists, for the educated general public, and simple, pictorial material. English is the common language for scientists, but for other audiences dissemination products are provided in local languages where possible. The DESIRE website and on-line Harmonised Information System provide access to all the project results and documentation, either directly on the screen, or by links to other websites, or by providing contact details for other listed products.

As in the first four years, the project has been presented at several international conferences, of both scientific and applied nature. During these conferences, talks about the project were given, the project leaflet, newsletters and info briefs were distributed and project posters were displayed. A DESIRE session was held at EGU 2012; in this session 12 oral presentations about DESIRE as well as about 20 posters were exposed.

Secondly, there have been various contacts with the press and media in several study sites. In year 1 plans were made with a film-maker to make a (series of) films about the DESIRE project. This film-maker, Manfred van Eyk from Viverra Films, the Netherlands, attended the second plenary meeting and already recorded some footage in the Cape Verde study area in year 1. In year 2, additional footage was recorded in Crete. In the fourth project year, Mr. van Eyk was also hired to produce a short introductory film about the DESIRE project. Additional footage for this film was shot in January 2011, and a first version of the film was ready by the end of year 4. The final version was displayed at CRIC in Bonn, early in year 5 (Figure 12-1). A sequel is currently being made by Mr. Van Eyk.

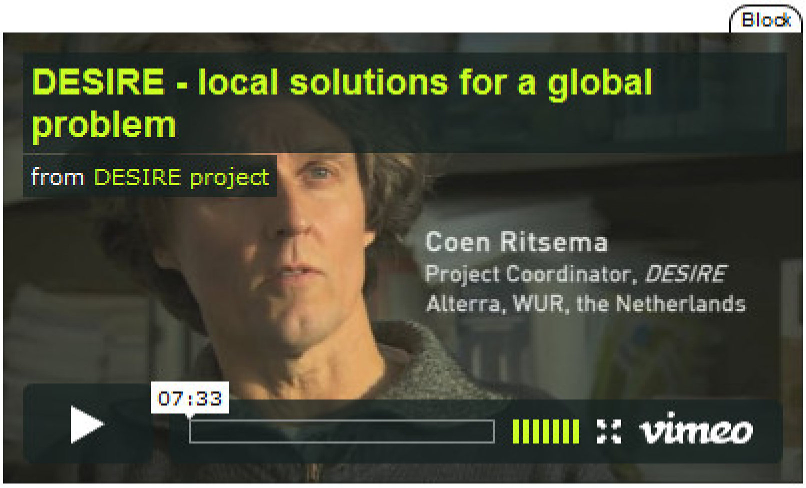


Figure 12-1 DESIRE introductory film.

Thirdly, a large number of new DESIRE products were made. These include a.o. factsheets, newsletter, policy briefs, info briefs, and leaflets, available under Key Messages on the DESIRE-HIS, http://www.desire-his.eu/en/key-messages. Most of these were circulated to over 200 DESIRE contacts/subscribers. Briefs were specifically developed for COP10 and for Land Day 5. Further information can be found in chapter 10.

Figure 12-2 The growing number of Fact sheet, Newsletter and Info-brief titles.

Fourthly, the project website has been developed further. The website provides general information about the DESIRE project, as well as information on its partners and study sites. There is a download page from which the public can download a number of documents.

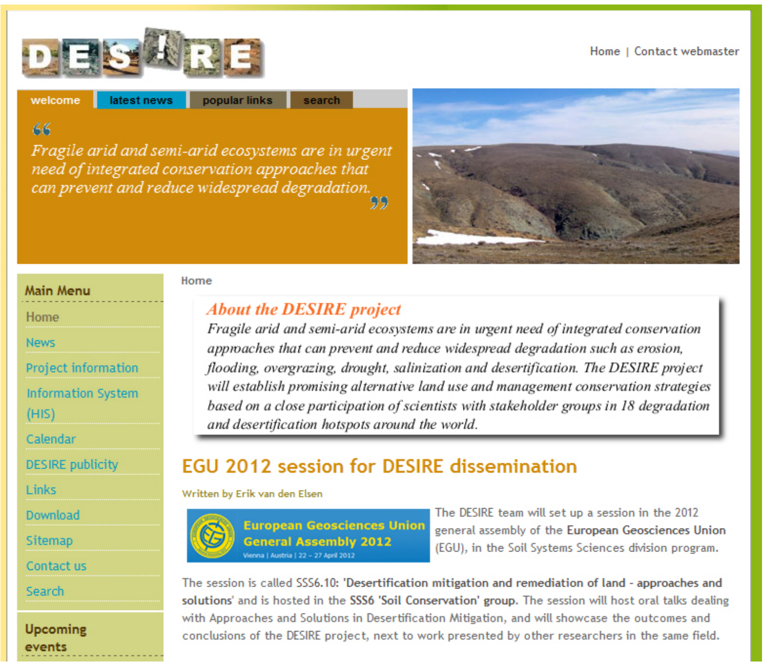


Figure 12-3 The DESIRE website http://www.desire-project.eu/

Finally, the Harmonised Information System (HIS) on the DESIRE website plays a central role in the dissemination of DESIRE results. Research results can be accessed according to the common steps taken through the project, and also according to each individual study site. As described in chapter 10 (WB6), the HIS has been significantly extended and improved in year 5. The software has been upgraded and the layout improved. The content is open for viewing by the general public as well as project partners. Project partners can use all the information, directly or re-organised for specific purposes or audiences, for dissemination in their own study site; an example would be to show pictures of conservation measures that are implemented in other study sites to local stakeholders. As described for WB6, the HIS will be the central storage of results of the DESIRE project, and will, when completed, provide these results in various formats to serve the needs of different types of stakeholders.

Figure 12-4 Web page of the Harmonised Information System on the DESIRE website, illustrating some dissemination options http://www.desire-his.eu/en/disseminating-results

Dissemination plans

The dissemination strategy followed a four-level approach: i) direct dissemination of R&D results into the international scientific community, ii) exploitation of new potential applications through interested parties, iii) training of highly skilled stakeholder staff, and iv) integration of results into "best management practices" for land managers. Dissemination plans have been by all DESIRE partners (see deliverable 6.3.2). A summary is given in Table 10-1. The dissemination means include a dedicated website, manual-style decision support system for land managers, farmers and extension workers, publications, handbooks, conferences, workshops, and training courses for different levels of expertise.

As mentioned in chapter 10, a Manual of Communication and Dissemination has been prepared by WB6, see: http://www.desire-his.eu/en/download-documents/cat_view/90-work-block-6-facilitating-dissemination. This manual has provided guidance for all partners, and Study Site partners in particular, helping them to approach the different types of stakeholders in ways that are appropriate. Much of this information is of general interest, perhaps for other EC-funded projects, and therefore the text has been adapted to provide a generic Manual of Communication and Dissemination. This is freely available to read and download from the Key Messages section of the DESIRE-HIS at: http://www.desire-his.eu/en/booklets-a-factsheets/794-manual-of-communication-and-dissemination

Suite of Dissemination Materials

DESIRE has produced a suite of dissemination products aimed at various stakeholders (deliverable 6.3.2). These materials do for example suggest "best management practices" as determined by research and testing in the study sites. These materials are available on web pages for those who can access this medium, in manuals on paper, and a further range of formats (booklets, leaflets, CDs, DVDs, PowerPoint presentations) as appropriate for other users.

Conferences

All DESIRE partners have continued to use opportunities to present the project results at conferences (see Table 12-1 and deliverable 6.3.3.). A special DESIRE session was organized during the EGU conference on 26 April 2012, to present the methods used in DESIRE and all the DESIRE products to scientists. In 2012, presentations will again be given at relevant scientific and applied conferences, such as ISCO meetings, COP meetings, CRIC meetings, ESSC meetings, and EGU meetings.

Sharing the knowledge

We have disseminated the results as well as the research processes we have followed, to fellow scientists and international organizations on a European level and through global networks such as UNCCD, UNEP, GEO and LADA as a method for assessing and responding to land degradation and desertification with a potentially global application. An email circulation list was compiled from visitors to the website and was used to alert potential users in the internet networks whenever new information or products become available. Material was also shared through email circulation lists in other projects (e.g. DESURVEY, LEDDRA), through international email circulation lists such as Land-L, and through international email newsletters, such as Desert Net International, and LandScan (UNCCD). In 2012, we will continue to share the knowledge gained in DESIRE in various ways.

An overview of major dissemination activities, both completed and planned is given in Table 12-1. A list of contributions to conferences, and of publications, is given in Annex 3 of the 5th periodic activity report.

Table 12-1 Overview of major dissemination activities in the DESIRE IP.

Dates	Type	Type of audience	Countries addressed	Size of audience	Partner responsible/ involved
From 2007	Project website	Scientists, stakeholders, general public	Worldwide	Millions (potentially)	1, 25
From 2007, to be continued after project	HIS	Scientists, stakeholders, general public	Worldwide	Millions (potentially)	1, 25 (info from all)
From 2007	Media (TV and newspapers)	General public	Mainly Crete, Cape Verde, Turkey	Millions (potentially)	1, 9, 10, 28
From 2007	Leaflet	Scientists, policy makers, various stakeholders	Worldwide	About 1000 so far	1, 17, 25
From 2009	Newsletters	General public, policy makers, stakeholders	DESIRE sites and worldwide	100-1000	1, 2, 4, 7, 14, 15, 20, 22, 25, 27
From 2010	Info-briefs	General public, policy makers, stakeholders	DESIRE sites and worldwide	100-1000	1, 6, 7, 12, 15, 22, 25, 26, 27
From 2010	Fact-sheets	General public, policy makers, stakeholders	DESIRE sites and worldwide	100-1000	1, 6, 7, 9, 10, 11, 15, 16, 19, 25, 27, 28
April 2011	EGU, Vienna	scientists	worldwide	500	2, 4, 14, 18
From Jan 2011	Short intro-film DESIRE	General public	Netherlands, Study sites, potentially worldwide	Thousands (potentially)	1, 7, 18, 28
Feb 2011	CRIC9, Bonn	Policy makers	worldwide	500	1, 5, 17
11 June 2011	Euronews film	General public	Europe	Millions (potentially)	1, 9, 28
March 2012	WWF6 Policy meeting, Montpellier	Policy makers	worldwide	hundreds	1, 19
April 2012	EGU conference, Vienna	scientists	worldwide	500	All
May 2012	DESIRE-WOCAT book	Scientists, land use planners, extension service	worldwide	Thousands (potentially)	All involved, coordinated by 1,5, 17
June 2012	Rio+20	Policy makers	worldwide	hundreds	16,19
2013	3 DESIRE special issues	Scientists	worldwide	Thousands (potentially)	All involved, coordinated by 1,3, 21

While sharing knowledge with fellow scientists is very important, DESIRE also focusses on communication and dialogue with stakeholders within and beyond the study sites. Some of the many different ways of doing this are referred to in Table 12-2 .

Table 12-2 Summary of current Dissemination activities and plans in the Study Sites

	Study site	Activity	Major Stakeholders
1	Guadalentín, Murcia, Spain	Local and national newspaper articles, workshop, oral presentations at conferences, scientific articles	Farmer associations, regional administration, local and regional policy makers
2	Macao and Gois, Portugal	Workshop, email and newspaper articles	Forest association City Council Foresters Regional authorities
3	Rendina, Italy	Leaflet, article in magazine, presentations at conferences, scientific articles	Farmer associations, regional administration
4	Crete, Greece	Poster, newsletter and leaflets distributed at workshop and meeting	Farmers, other social groups, rural communities
5	Nestos, Maggana, Greece	Leaflet and poster distributed by hand, email and at relevant meetings.	Farmers and local administrators
6	Karapinar, Turkey	Leaflets distributed by hand in study site and interview broadcast on TV and radio.	Farmers, general public
7	Eskisehir, Turkey	Leaflets distributed by hand in study site and interview broadcase on TV and radio.	Farmers, general public
8	Mamora, Morocco	Leaflet distributed by hand, policy brief, presentations at conferences, scientific articles	Farmers, technicians, associations, local administrators, plus women's groups, youth groups, students, local and wider community, researchers and technicians with similar problems in other areas or countries
9	Zeuss Koutine, Tunisia	Flyers, CDs and policy briefs circulated by email and distributed at meetings. Special journal issue.	Farmers, NGOs, development agencies, general public, national and international researchers
10	Dzhanybek, Russia	Presentations, Booklet, Poster,	Farmers, local specialists, scientists,

		Written material in field trips and conferences, Video, HIS in Russian, WOCAT in Russian	local/regional administration, general public
11	Novy, Russia	Presentations, Booklet, Poster, Written material in field trips and conferences, Video, HIS in Russian, WOCAT in Russian	Farmers, local specialists, scientists, local/regional administration, general public
12	Yan River Basin, China	Papers and reports, leaflets, posters, handed out at meetings and in discussions and workshops. Website.	Farmers, local experts, water-shed managers, local managers of industries, general public, children, researchers, journals and newspapers
13	Boteti, Botswana	Scientific publications, posters, workshops.	Workshop stakeholders, village development committees and Trust, farmers, village leaders, householders, general public, decision-makers, environmental NGOs, scientists, teachers, schoolchildren,
14	Cointzio, Mexico	Presentations and discussions at workshops and field trips.	Farmers, farmer associations, schools, local and regional administrators, rural communities, general public, environmental institutions,
17	Secano Interior, Chile	Booklet, poster, field trip information, video, diaporama	Farmers, technicians, local to national administration
18	Santiago, Cape Verde	Video, leaflets, factsheets, newsletter, discussion, presentations, local radio.	Land users, farmers, Farmer associations, Local officials of delegation, Local officials of municipalities, Students

12.3 Section 3 - Publishable results

Not applicable.

The DESIRE project (2007-2012) is funded by the European Commission, VI Framework Program, 'Global Change and Ecosystems' and the governments of France, the Netherlands, Italy and Spain. It brings together the expertise of 26 international research institutes and non-governmental organisations (NGOs). This project is coordinated by ALTERRA – Research Institute for the Green Living Environment, the Netherlands.

Website: www.desire-project.eu

Contact DESIRE coordinator: Coen.Ritsema@wur.nl
Contact DESIRE Communications: ngproject3@googlemail.com
Contact EU Scientific Officer: Marie.Yeroyanni@ec.europa.eu

The opinions expressed in this newslett er and on the website are those of the DESIRE project consortium and do not necessarily reflect the views of the European Commission.