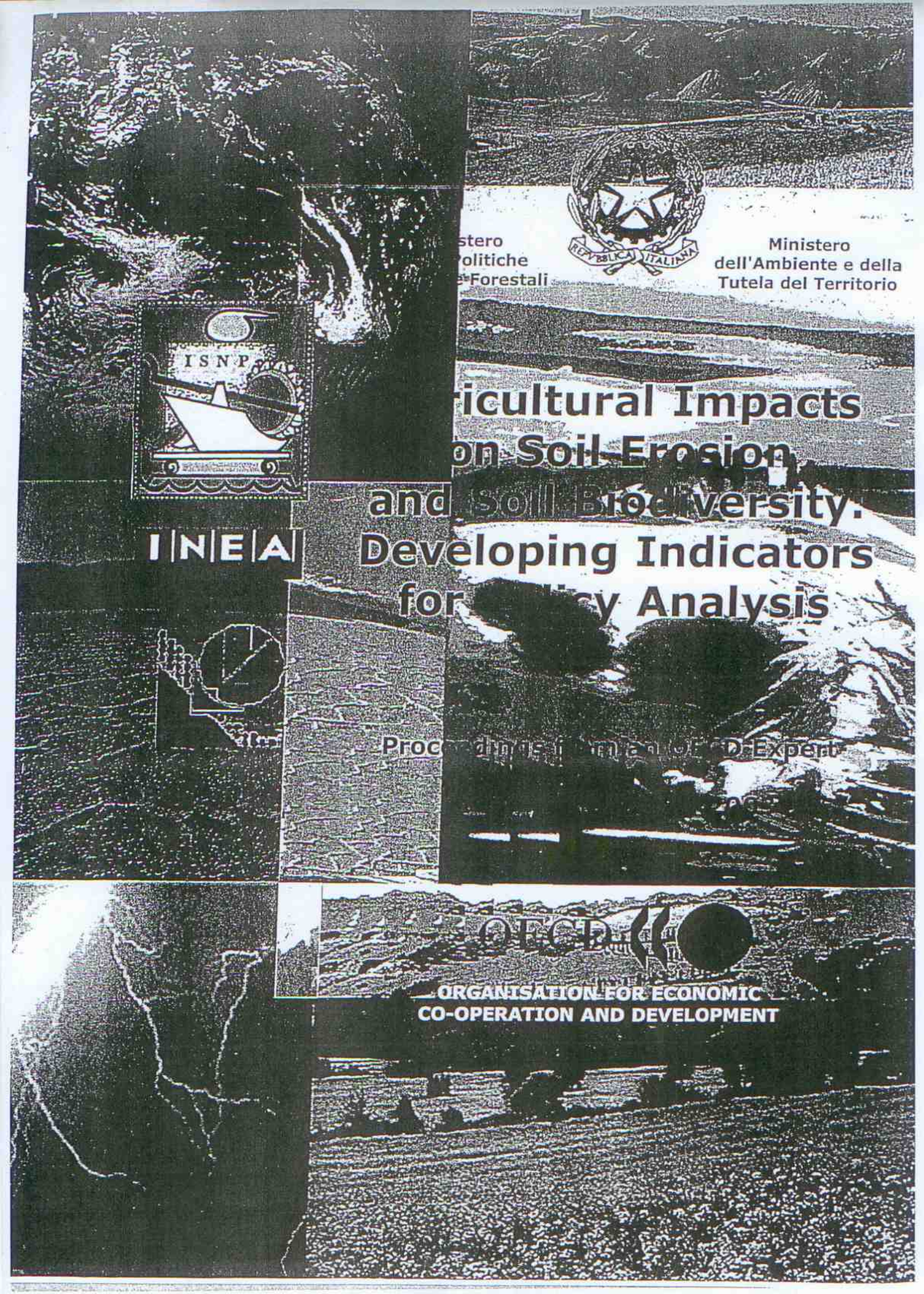
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Developing Indicators
for Policy Analysis
Proceedings from an OECD Expert
OECD
ORGANISATION FOR ECONOMIC
CO-OPERATION AND DEVELOPMENT

# A PARTICIPATORY APPROACH TO IDENTIFYING ECONOMIC INDICATORS RELATED TO SOIL BIODIVERSITY: EMPIRICAL EVIDENCE FROM THE NORTHERN MEDITERRANEAN COUNTRIES

N. Geeson [1], G. Quaranta [2], R. Salvia [2]

1. Department of Geography, King's College London, UK,

2. Department of Agricultural Economics and Land Management, University of Basilicata, Italy

*Abstract*

This paper demonstrates some preliminary results from the DESERTLINKS project funded by the EU and involving nine European research units. The principal aim of the project is to provide a link between scientific research on the main aspects of desertification problems, and local actors involved in land resources management. The major product from the project will be a Desertification Indicator System designed to be used by both scientists and stakeholders, at all levels of knowledge and with a wide-ranging perspective, from local to national and regional. The Desertification Indicator System is based on identifying the main problems or issues of desertification, and selecting indicators to address these issues.

Within four Target Areas located in Italy, Greece, Spain and Portugal, indicators have been developed by working with local stakeholders and taking into account their different perceptions of desertification, land use type and decision-making processes. The methodology is innovative in that it allows both bottom-up and top-down flows of information. This is fundamental to the success of selecting the most effective land management practices to mitigate land degradation, and provides indicators for the identification of desertification risk, as well as for management methods and techniques. In the European Mediterranean countries many of the indicators related to soil biodiversity may be viewed in a socio-economic or political context. This can be important in the analysis of effective policies. These ideas are illustrated by results from stakeholder workshops held in the Target Areas.



## Introduction

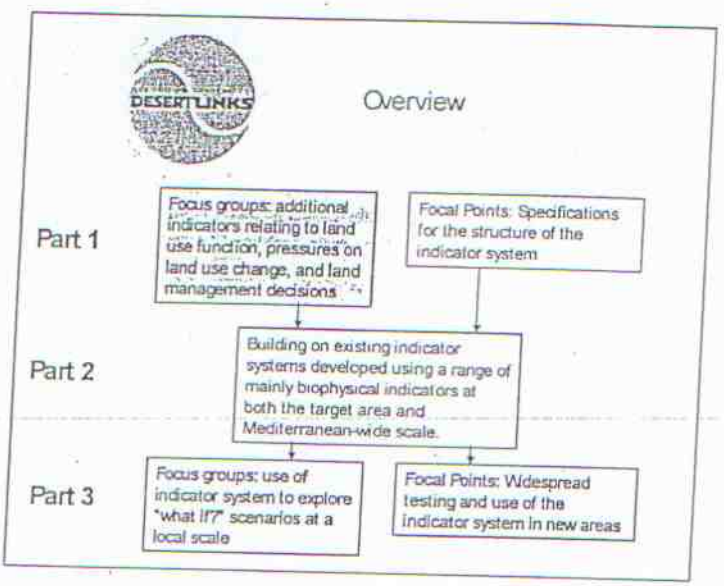
The title of the DESERTLINKS project is "Combating desertification in Mediterranean Europe: linking science with stakeholders". This means that instead of scientists suggesting ways of combating desertification based solely on their understanding of the science, the scientists are consulting with stakeholders to find out which factors are most important in practical terms. The stakeholders include administrators, politicians, technicians and members of the farming community, at local to national levels. Portugal, Spain, Italy and Greece are part of Annex IV of the United Nations Convention to Combat Desertification (UNCCD). Each of these countries has a National Action Programme and those responsible for its implementation are part of that country's Focal Point. The main aim of DESERTLINKS is to develop an interactive web-based Desertification Indicator System (DIS) for Mediterranean Europe and test it with the local stakeholders and the Focal Points. The DIS is currently being developed in four Target Areas in Portugal, Spain, Italy and Greece, where there is already a wealth of existing physical data derived from the preceding MEDALUS projects (MEDALUS III Final Report, 1996). Some stakeholder workshops have been carried out, and more are planned. The desertification indicators and ideas that emerge from these workshops are being added to a data base and integrated into the DIS.

**Keywords**: participatory approach, economic indicators, soil biodiversity, desertification, land management

## An overview of the DESERTLINKS project

Figure 1 shows the structure of the DESERTLINKS project. In Part 1, consultative workshops with local stakeholders are being used to discuss local problems and issues, and to describe indicators associated with these problems and issues. In the literature there are already a large number of indicators described and in use, not just for desertification but also for many other purposes, including sustainability and biodiversity. Many contemporary schemes have been reviewed and evaluated, and ideas for indicators in the desertification context have been extracted.

Figure 1. An overview of the DESERTLINKS Project




Source: DESERTLINKS



Composite indicators will be developed in the second part of the project. This has begun by further developing and up-dating the Environmentally Sensitive Areas system from the preceding MEDALUS III project (Kosmas *et al.*, 1999). All the available data for the Target Areas has been re-organised and some statistical procedures have been further tested in the Agri basin, southern Italy. The Regional Degradation Index (RDI) mapped for the whole of the northern Mediterranean area has also been further developed, in conjunction with the EU –funded PESERA project. Ways of assessing future land use trends will be important, and in the Guadalentín basin, southern Spain, progress has been made in compiling and assessing all available information to describe land use changes over the last 30 years.

The final part of DESERTLINKS will combine all the ideas for the composite Desertification Indicator System. The DIS is being designed so that it can be used by people from different backgrounds, whether they are interested in the science or whether they just need a method for describing or classifying the land on their farm. The system will also be used to explore different management options. There will be close collaboration with both local stakeholders and the National Committees of the Focal Points to test the application of the indicator system in new areas and to validate the local identification of high risk areas and the implications of local scenario analyses. The experiences gained in both the testing and validation will be formulated into guidelines for the UNCCD on the development and use of indicators to manage desertification.

## Desertification issues

Many studies from different organisations have compiled lists of indicators associated with desertification. In the DESERTLINKS Project it was decided that all the indicators that would be used in the DIS should conform to some basic criteria, particularly according to the ease and scales at which they could be measured. Indicators should be "reliable, relevant, reproducible, representative and realizable" (Wilson and Buller, 2001). In addition it had to be clear that the indicators were associated with specific problems or issues. The first step was to review the National Action Programmes and associated national documents to establish what were the main problems or issues in each country (Geeson, 2002). Ideas were also collected from regional expert groups and parallel projects. Questionnaires distributed to the general public, and consultation within stakeholder workshops identified the problems important to the local communities in the Target Areas. The same problem or issue can occur at a number of scales. For example, financial support for the improvement of grazing land tackles the problem of overgrazing, but it is also part of a package of political measures. The political measures are part of a general protection strategy against overgrazing, and this in turn is part of a Code of Good Agricultural Practice.

Table 1. The main concerns to emerge from questionnaires distributed to the general public in the Target Areas in 2002, in order of perceived importance

| | Beja | Mertola | Agri | Guadalentin | Lesvos |
|---|---|---|---|---|---|
| 1 | depopulation | depopulation | lack of water | deforestation | lack of water |
| 2 | lack of employment | advance of deserts | drought | lack of water | drought |
| 3 | drought | deforestation | deforestation | drought | increase in temperature |
| 4 | deforestation | drought | temperature increase | soil erosion | fire |
| 5 | poor infrastructure | lack of water | climate change | aridity | deforestation |
| 6 | lack of water | lack of employment | fire | desert advance | destruction of vegetation |
| 7 | desert advance | climate change | desert advance | biodiversity loss | soil and water pollution |
| 8 | soil erosion | soil erosion | ozone layer destruction | fire | Depopulation |

Beja and Mertola are in Portugal, the Agri Basin is in southern Italy, the Guadalentin Basin is in S.E. Spain, and Lesvos is a Greek island in the Aegean Sea

Source: Brandt and Geeson, 2001, DESERTLINKS

Most desertification problems identified for the DIS affect all four countries being analysed, but there are differences in priorities. It is evident that the physical shortage of water is a more important factor in Spain and Greece than it is in Portugal and Italy, but all countries now agree that desertification is caused more by human mis-management and exploitation of resources rather than adverse physical conditions. All countries include lists of the ways in which desertification can be both corrected and prevented. All countries accept the need for an established monitoring system and early warning network which requires the use of indicators. There is little information as yet on the evaluation of the success of the use of strategies in any particular circumstance.

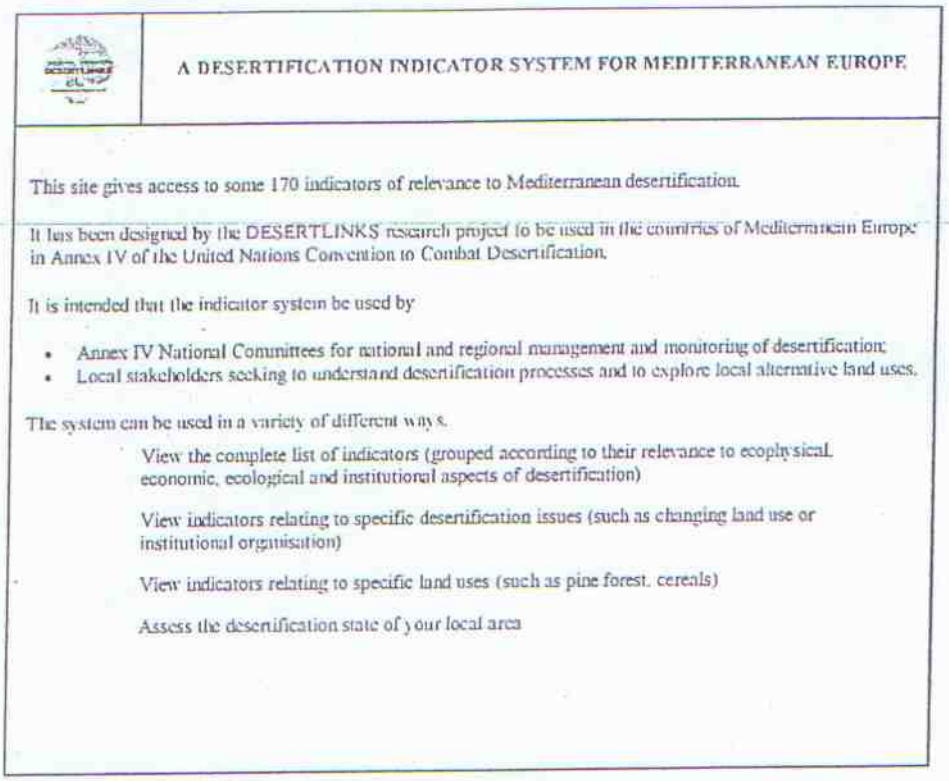
The results from the questionnaires to the general public showed some interesting differences and similarities to those seen at a national level (Brandt and Geeson, 2002). Drought and water availability are factors that feature strongly at both local and national levels. Soil erosion does not seem to be as important at local level as it does at national level. At local level problems that affect people personally, like depopulation and lack of employment, are much more prominent (Table 1).

Once the desertification issues were identified they needed to be simplified and classified for use in the DIS. So that the interactive web-based Desertification Indicator System can be useful to as many different people as possible there will be several routes of entry. People who are interested in a particular problem or issue will be able to find that issue listed within major themes. For

each issue it will be possible to connect to a list of relevant indicators, matched or chosen by experts within DESERTLINKS. All the indicators will be fully described, with ancillary information available if appropriate, in more scientific detail. Some other people may be primarily interested in the lists of indicators, and their interest in the associated issues will be secondary. Some people may be interested in indicators related to a particular type of land use. A fourth use of the system is that anyone with simple basic data for an area of land will be able to determine the Environmentally Sensitive Area classification. This can be a very useful tool in sustainable land use planning.

All four of the Annex IV countries are already using combined indices relating to various combinations of climate, soil, land use to produce national maps of desertification risk. Portugal, Italy and Greece are also planning to extend their range of indicators to include those described in the MEDALUS Manual on key indicators of desertification and/or the ANPA book "Desertification Indicators for the Mediterranean Region" (Enne and Zucca, 2001), many of which are the same. Representatives from the Focal Points have been given a prototype of the DIS so that their comments and requirements can be used to improve the System throughout its development.

Figure 2. Entry into the interactive web-based DESERTLINKS Desertification Indicator System




Source: DESERTLINKS Desertification Indicator System for Mediterranean Europe, Prototype Version #3

## Organisation of the stakeholder workshops

Stakeholder workshops were carried out in all four Target Areas: the Alentejo (Portugal), the Guadalentín Basin (Spain), the Agri Basin (Italy) and the island of Lesvos (Greece) areas, with stakeholders from the local farming and administrative communities. Common objectives of the workshops included:

- Identification of the desertification impact in areas already affected by desertification in terms of the value of functions being threatened by desertification
- Identification of candidate impact indicators arising from the perception of desertification and its impact on land function (such as loss of biodiversity, sedimentation, reductions in crop yield)
- Identification of the information needs within the scientific community, especially in terms of requirements for a Desertification Indicator System

The workshop organised in the Agri Basin (Italy) involved a local Stakeholder Group represented by farmers, farmers' organisations, national and regional UNCCD Focal Points, the National Agency for Environmental Protection, local administrators, mass media and representatives from local high school teachers. The workshop was organised in two phases. In the first part, all the project research activity and the first results from an enquiry into the perception of desertification were presented. The second step directly involved the Stakeholder Group, in discussion of two themes proposed by the organiser. The first theme asked for the signs of the desertification and a way to describe them (this was a way of asking for indicators). The second question concerned discussion of possible strategies to combat desertification, and opinions on the effectiveness of mitigation approaches and policy needs. To guarantee the success of the Workshop, the initiative was very well advertised and reported in the local newspapers. About 160 local people actively participated.

The Workshop held in Greek Target Area (Lesvos) was organised in collaboration with the local authorities, in order to become more attractive to the local stakeholders. The methodology followed was similar and about 40 people attended. Most were land managers, or representatives of local public and private organizations.



In Portugal the Workshop was organised in conjunction with the National Focal Point, in four areas of the country (including the DESERTLINKS Target Area of the Alentejo). The methodology and the local involvement remained comparable with that in the other Target Areas.

In Guadalentín Basin (Spain) the Workshop involved a large number of local stakeholders including representatives from regional environmental administration, officials of regional rural development administration, and officials from local municipalities, as well as representatives from the main agriculture unions, representatives of environmental NGOs and representatives of academic and research institutions.

All the organised workshops have been very revealing about peoples' perception of the causes of desertification. Depopulation and lack of employment were the two highest rated problems in Portugal while in Spain, Italy and Greece drought and lack of water were considered the most important factors. Deforestation was another factor that was towards the top of the list for all countries. The suggested candidate impact indicators of desertification that have emerged from the workshops do not tend to be quite the same as those considered important in the National Action Programmes. These are generally dryness, drought and erosion. Extensive questionnaire collection was completed, in association with the workshop described above and other workshops yet to be held. The questionnaires are being analysed.

The impact of policies in a local framework, on each Target Area, is being evaluated, and the success in the application of the agricultural and environmental measures funded by the EU is being analysed. The purpose is to assess the consequences in terms of desertification. There are policies to introduce agricultural production methods compatible with the requirements of the protection of the environment. The measures involved could become an instrument to correct the environmentally negative effects produced by sectorial aids promoting agricultural production.

The indicators database is intended to be primarily a tool for DESERTLINKS partners, but after the end of the project it will be available, with scope for further development, to a wider scientific community and to stakeholders with an interest in desertification. In this way a growing number of relevant desertification indicators will become available and constitute a valuable support to decision makers.

## Use of questionnaires

During 2000-02 there was a big effort in European Mediterranean countries to update national statistical information with the creation of General Censuses (population, agriculture and industry). These are the only official records at municipality level, *i.e.* the smallest statistical unit in the adopted system. Unfortunately only some aggregated data have been released so far. To supplement this information questionnaires have been used in all the Target Areas. The questionnaire is divided into three main parts. In the first part there are questions about the demographic characteristics of the farmers and their families, on the labour employed for agricultural activities (family labour as opposed to waged labour), on the structural characteristics of the farm and about land use (crops and general information) for the individual land parcels composing the farm. The second part examines cultivation practices and livestock production management. It is particularly important to discover what changes have taken place during the last 50 years, in terms of cultivation techniques and farm organisation. The third section includes questions about the perception of desertification and other general information on farm management linked to response indicators.

Besides the demographic features of the family and the structural characteristics of the farms, the field investigation gathered valuable information about the agricultural techniques and the range of crops. For example in the Agri basin (Italy) thirty different crops have been analysed, covering about 98% of the UAA, that is all the commercial crops from the area. For each of them, such as wheat and olives, details of all possible cultivation techniques have been collected. Where possible the history of cultivation practices has been evaluated, to construct a set of past, current and "potential" techniques. All the information is organised within an electronic database. In order to check both the environmental and the economic sustainability for all the crops and for all the possible techniques, economic data have also been collected. All this information has also been of great value as a basis for statistical correlations, between land status and calculated risk, and for discussion within the stakeholder focus groups, to assess the effectiveness of associated indicators.



## Indicators relating to soil biodiversity

Desertification results from climatic stresses and pressure from non-sustainable human activities as well as climatic stresses, so that even economically developed countries such as Italy are affected. Drought and desertification may have the same results, but it is also possible to find either one without the other. In Italy different regions face different problems. In Sardinia and Molise soil erosion associated with grazing has been studied to establish a maximum sustainable grazing pressure. In Campania water resources are a problem and an irrigation advisory service has been set up. Other regions have problems with forestry and fire risk, or salinisation. The Italian Focal Point considers one of the most important indicators of desertification to be loss of organic matter in the soil. The most obvious ways to combat desertification and drought are to: protect the soil, manage water resources sustainably, reduce the impact of agricultural production and restore land. Various legislative Acts and regulations are already in place.

Listing specific indicators concerning soil biodiversity that can be used to monitor the process of desertification in the Mediterranean Basin is very difficult, due to the multiple causes of desertification. Nevertheless one of the most important categories involved is associated with

human activities, as these are always mentioned and discussed among the Stakeholder Groups. Table 2 gives examples of indicators from the DIS, listed under the "economic" category, which can be considered both strictly related to soil biodiversity and of high importance to the affected population. Since the fight against desertification is seen primarily as a management challenge and not simply a technological or financial one, then some emphasis on indicator development has been made on measuring the effectiveness of policies involving stakeholders. For example, the governments of most countries already influence land use through their agriculture, forestry and fisheries policies and planning processes; and use various kinds of information to arrive at their decisions. However traditional environmental indicators that focus on the use of pesticides and fertilizers, crop productivity, land conservation and so on, ignore human and institutional performance even though this is often the critical factor in success.

The main idea behind this selection of indicators is that agriculture can be sustainable in the economic and social sense only if it is sustainable in an ecological sense. Otherwise in poor rural areas where subsistence agriculture is practiced there is a big risk of consequent depletion of soil and other natural resources (Quaranta and Salvia, 1999). Within the DESERTLINKS Target Areas the variability of the indicators chosen shows an interesting correlation among soil biodiversity and human behaviour. Other than the obvious pure economic indicators, there are others that play an important role. An example is farm size. At first it is not apparent that this is associated with soil properties, but where farm size increases, loss of boundary features is implied, along with increase of capital and chemical inputs replacing labour. Demographic features are also important. For example, the family-farm is the most common form of agricultural organization, not only in Europe but world-wide, where the age or the educational level may be inadequate to both understand and try to avoid or mitigate the land degradation phenomenon (Quaranta, 2003).



All these indicators highlighting socio-economic factors and influencing soil biodiversity are easily obtainable. Further useful research activity would be the development of a comprehensive and consistent approach to link biophysical data with economic indicators relevant to soil quality and land degradation assessment.

Table 2. Indicators from the DESERTLINKS Desertification Indicator System relating to soil biodiversity

| Indicators | Definition |
|---|---|
| GDP per capita | Annual or period GDP at current/constant prices divided by population |
| Land use index | (from Corine) |
| Land use type (current) | Arable/Tree crop/ Pasture/Forest etc from survey or RS |
| Land use intensity | High, medium or low |
| Period of existing land use type | no. of years with same land use type |
| Farm ownership | private, rent, state |
| Farm size | Hectares |
| Farmer's age | (years) |
| EU production subsidies | Per /area, /animal, /kg |
| Net farm income | Euro/ha |
| Crop Productivity | Statistical returns, survey of model, by crop |
| Tillage operations | Numbers of tillage operations per year |
| Fertilizer application | kg/ha |
| Irrigation intensity and seawater intrusion | Irrigation works and map of seawater intrusion |
| Sustainable farming | Measures implemented from check list of good practice |
| Organic farming | Area with organic farming as a percentage of total agricultural area |
| Agri-environmental management | Percentage of agricultural area under agri-environmental measures following Regulation No. 2078/92. |

Source: A selection from DESERTLINKS Desertification Indicator System for Mediterranean Europe

## Conclusions

The DESERTLINKS Desertification Indicator System is evolving in response to a need for desertification indicators at national and regional level. It is based on previous long-term research and field-based determination of environmentally sensitive areas (ESAs) in Target Areas in Portugal, Spain, Italy and Greece. Indicators are being selected from those suggested by ESA research, those already in use (especially those included in National Action Plans), those suggested by local stakeholders, and those suggested by other experts, such as those from the Focal Points of Annex IV. Users of the Indicator System will be able to find relevant indicators associated with particular existing problems. They can also examine a list of indicators to establish which parameters may be useful to monitor, or use as part of an early warning system. Many of these indicators can be related to soil biodiversity, as it is often economic factors that influence land use, and choice of land use can change or sustain physical soil properties.

For information about DESERTLINKS and the Desertification Indicator System, see the website: http://www.kcl.ac.uk/desertlinks or email desertlinks@medalus.demon.co.uk

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