

## **Symposium**

**“L’Évaluation, clé de réussite d’une politique  
de gestion durable des terres”**

**“Assessing benefits of SLM – Key for success”**

**19 October 2009**

**Faculté des Lettres et Sciences Humaines, Université Mohammed V Agdal, Rabat**

**Organised by the UNESCO-GN Chair, WOCAT and DESIRE**

**Moderator: Gudrun Schwilch - CDE**

## Welcome and opening statements

*Prof. Abderrahim Benhadda, Dean of the Faculty, Université Mohammed V-Agdal, Rabat, Morocco  
Representative of the University, the Agriculture Department, the Forest Department, Morocco*

M. Benhadda welcomes the representatives of the university Mohammed V, and the DESIRE and WOCAT networks. He is honoured to be able to open this symposium of relevance to national politics concerning the management of natural resources. Geographical research is a core activity of this university and more widely in Morocco, being at the basis of sustainable land management. The UNESCO-GN Chair has played a catalyst role for the spread of information and research on sustainable land management (SLM) in Morocco. This symposium offers the possibility to connect the work of the WOCAT and DESIRE networks in Morocco, in correspondence with the work of the national forestry school. At the same time it is an encounter of the human and environmental sciences. M. Benhadda thanks all institutions and persons who have contributed to the symposium.

*The permanent Secretary of the Academy of Hassan II of Sciences and Technologies*

The permanent Secretary of the Academy of Hassan II expresses pleasure to participate in the symposium. The theme chosen is of great interest, because of the importance of agriculture and the mobilization of researchers and experts at the international level, to discuss questions on sustainable land management, political routes for natural resource management, particularly with regard to agricultural land, with the final aim to improve agricultural productivity while safeguarding natural resources. This is an excellent opportunity to handle political questions on sustainable land management.

Science and research have an important role to play in addressing problems with the management and fertility of agricultural land, with land degradation and desertification. This has to do with the management of soils, agricultural land and water. The implementation of SLM strategies can support these efforts. The approaches presented should also address the difficult components of the systems, and appropriate techniques for the settings concerned.

Scientific knowledge is essential in this respect for two reasons: firstly to design and implement measures, which take account of economic and social aspects of the societies concerned, and secondly to address environmental consequences for ecosystems. Social acceptation should also be assessed in economic cost-benefit analyses.

Research can help to quantify the results of integral political choices for the exploitation of the land. Environmental technologies function as an engine for land management in general. However, social aspects must be considered, including the social feasibility of implementing new technologies, in consultation with actors involved.

Current problems with land management and water resources cannot be solved by research alone. A system of rules and directives is required, following axes of research and themes. The effects of climate change selected by the Academy, which refer to terrestrial ecosystems, will guide this development. The Academy will consider the results of this symposium for further action with great interest.

*The Representative of the Haut Commissariat des Eaux et des Forêts*

Degradation in dryland areas is experienced to a large extent in Morocco, with longer periods of drought, poor soils, and increasing needs of the population. Morocco has performed actions to combat these phenomena for a long time, also with respect to conservation of forest areas. There is a lot of experience and results, but the conclusion is that degradation continues. This is illustrated by the extending area of degrading land in the Atlas and Rif mountains, eroding terrains and the siltation of reservoirs. This symposium is a perfect occasion to discuss these problems and to find solutions.

Morocco ratified the UNCCD in 1996. The country has programs to protect forests, and a strategy for integrated basin management. About 60.000 ha is annually treated per year in the national program. The Haut Commissariat develops programs to model and quantify soil erosion, to develop indicators, and to develop methods to mitigate land degradation. Apart from that, there is international cooperation, which again strengthens human capability, the scientific potential of the country. The Commissariat has partnerships with research institutes. In 2007, a platform for institutional collaboration on sustainable land management was opened.

*Dr. Hanspeter Liniger, WOCAT Coordinator, Centre for Development and Environment (Switzerland)*

Dr. Liniger thanks the organizers of the symposium for the invitation. He considers the main aim of the symposium to join forces, to advance SLM, to collect information and to improve our understanding of degradation and conservation. SLM practices are there to learn from them, and to make them available to potential users.

WOCAT is a network of soil and water conservation specialists, started in 1992, with the mission to join forces that different people work together. WOCAT provides a methodology to exchange knowledge and experience, and to use experience for better decision making. The recent annual meeting of the WOCAT network took place in Ifrane last week. The focus was on developing tools usable by different types of professionals. WOCAT's mission is to define a common activity and to share and exchange information on SLM, as an alternative for the wide range of separate projects and programs running on land degradation and sustainable land management. SLM is central not only to people living on the land, but to all human beings. The importance of SLM was successfully conveyed in the recent meeting of the UNCCD<sup>1</sup>.

*Prof. Coen Ritsema, Coordinator of the DESIRE Integrated Project, Alterra (The Netherlands)*

Prof. Ritsema thanks the dean and the organizing institutions for inviting the DESIRE consortium in Morocco. The DESIRE project was submitted by a large number of partners from all over the world. It is a scientific project, funded by the DG Research of the European Commission. One of its aims is scientific innovation, but at the same time the project is oriented towards solutions.

The DESIRE plenary meeting in Morocco will give the consortium the opportunity to learn this week from the Moroccan colleagues about the problems and solutions to land degradation and desertification in Morocco. Prof. Ritsema expects that the symposium will join forces between WOCAT and DESIRE, thus benefiting many others. WOCAT is a long lasting initiative, DESIRE a new comer. The WOCAT network, tools and methodologies are embedded in the DESIRE consortium.

Prof. Ritsema thanks the organizers for the effort to organize these two meetings, thanks the authorities for their support, and wishes a fruitful meeting to all participants.



**Left:** *Opening statements and welcome speeches. (photo: Ch.Hauert).*

**Right :** *Question raised by Prof. Abdellah Laouina. (photo: HP.Liniger)*

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<sup>1</sup> United Nations Convention to Combat Desertification

## Key note lecture

### Sustainable Agriculture in Morocco and the Mediterranean area

*Guillaume Benoit, General Council of Agriculture, Morocco*

The lecture of M. Benoit addresses sustainable agriculture in Morocco in relation to the Mediterranean. The agricultural sector concerns more than the producers alone. It forms the link between the civil society and the environment. The vision of the General Council of Agriculture is to move from conventional agriculture to sustainable agriculture.

Recent developments in agriculture include the development of new knowledge in the encounter of agriculture and environmental issues, a new focus on cities situated in agricultural areas, and short circuits between cities and peri-urban agriculture. Finally there is the upcoming of a green economy versus the conventional economy.

The reasons for change include the reconsideration of biophysical and economical resources, the rising costs of energy, new demands from societies, technological innovation, and the political focus on sustainability.

#### *The Mediterranean*

The Mediterranean is an area with a traditional backlog due to its mountainous character. It has known a demographic rupture, with an enormous population growth since 1600, mainly in the southeastern part. It nowadays suffers from a problematic explosion of urban areas.

Agriculture is an important sector in the southeastern part. It uses a large part of the available freshwater resources (83%), with heavy impacts on the environment. Agricultural systems are characterized by the limited use of irrigation, a large variety of production systems, and the importance of pastoralism.

Problems of the Mediterranean include marginalization and overexploitation of the hinterland. Other problems include the overexploitation of water resources, decrease of groundwater levels, desertification, fires, and droughts. In the period from 1950 till 2050 30% of the freshwater resources is estimated to be lost for societal use. In the plains along the coasts and rivers there is competition for land, urbanisation, salinization, inundations, and a retreat of agriculture. There is a tendency to a rental economy. At the same time the Mediterranean is characterized by a large natural, cultural and agricultural diversity.

#### *Morocco*

Morocco has 5 large ecosystems: the mountains, the Saharan oasis, the semi arid region, the favorable 'bour' (rainfed agricultural areas), and the large irrigated agricultural areas. 80% of the population, 66% of the agricultural area and 70% of the agricultural enterprises is located in the first three zones, with difficult environmental conditions for economic activities.

The plan 'Maroc vert' (Green Morocco) aims at providing irrigation over a million acres for a million agricultural enterprises, and professionalizing smallholder agriculture, by initiating a new agricultural policy. Morocco has 1.5 million exploitations in 3 main categories: 'circuits marchands', 'bancables/PMEA' and micro-exploitations.

#### *Vision on sustainable agriculture*

The vision on sustainable agriculture of the General Council of Agriculture includes:

1. The professionalization and structuring of the smallholder agriculture in the southern and eastern part of the country
2. Adaptation to climate change and water shortage

3. A new peri-urban agriculture, with valorization and protection of agricultural land, development of a system of agro-chains
4. A sustainable form of agroforestry and pastoralism, not only aiming for production, but also for environmental services and public goods. This requires plans for progress, contracts, the settling of use rights and obligations, the integration of land use functions, and multifunctional performance of agricultural enterprises.
5. Enhancing the dynamics of agricultural areas ('terroir'), by valuing specific new markets, quality products and services, tourism, crafts, and local communal relationships.

#### *Conclusion*

The Mediterranean and Morocco in particular are vulnerable environments, demanding for new contracts between the agricultural sector and societies, founded on innovations.

#### *Questions*

Abdellah Laouina: smallholder agriculture received much attention in your lecture. How can the large scale agriculture become sustainable? Response: the large scale agriculture can bring innovation to the smallholder agriculture.

Rachida Nafaa: will there be a social arrangement for the strategy presented? Response: M. Benoit recognizes that there are obstacles to the implementation of the new policy, but mentions several examples of international strategies in the Euro-Mediterranean zone, directed towards social stability and food security and safety.

## **Assessing Benefits of SLM within WOCAT and DESIRE**

### **WOCAT - Network and tools for assessing the benefits of SLM**

*Dr. Hanspeter Liniger, Coordinator WOCAT, CDE Bern, Switzerland*

The adagium of WOCAT<sup>2</sup> is to move from degradation to SLM: away from researching degradation, towards sustainable land management (SLM). Land by definition includes soil, water, vegetation, animals and people. SLM (according to the UNCCD definition) is land management in such a way to maintain and improve ecosystem services for human well being, as negotiated by all stakeholders. There is much experience in SLM that is not being used. The mission of WOCAT is to use and share this experience. The focus of research and actions in SLM thus far has been on soil erosion. We must think much more about biological degradation and water degradation.

#### *1. Why assessing benefits?*

Dr. Liniger shows SLM examples from the WOCAT book 'Where the land is greener' and from the DESIRE Integrated Project. WOCAT has many examples on crop land, but less on grazing land. We should build on this knowledge, not only that coming from research or projects, but also directly from land managers. Furthermore we should not repeat mistakes, recognize complexity, understand local fine tuning, and use assessment for spreading SLM. But the knowledge so far is still fragmented, not systematic, and there is no mapping of the spread of SLM practices. There are a lot of reports coming out on success. But how can we access this knowledge, and compare between the different systems that are presented? Therefore we need standard methods and tools.

#### *2. Standard methods and tools*

WOCAT provides standard methods and tools at 2 levels: SLM technologies and approaches and mapping. The standardized documentation for SLM strategies provides a standard format for categories of information on SLM strategies, e.g. environmental setting, impacts, strengths and weaknesses.

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<sup>2</sup> World Overview of Conservation Approaches and Technologies

SLM approaches embody what was needed and is behind the technology to implement it. Examples are training, initiation by the government, or spontaneous spread from farmer to farmer. Or an incentive based catchment treatment.

A lot of examples of documentation are coming up from China, from Nepal, ICIMOD, Bangladesh Ethiopia, S Africa, and Mongolia, but we need more examples. Apart from national books, WOCAT provides information through the internet. The people providing the information are the owners of that information.

Mapping is necessary to document spatial relationships in the landscape affecting SLM strategies. Upstream situations have impacts on downstream settings. Mapping of degradation and conservation may help to design catchment approaches to SLM, to estimate off-site impacts, and to decide on where to invest in SLM.

### *3. Use of monitoring and assessment for decision support*

Providing decision support on SLM falls back on the questions: which SLM technology and approach to choose, where, at which costs, which are the impacts? Will they alleviate poverty? The first question is: when to intervene? To maintain a productive situation means prevention of land degradation. Intervention in the next stage comes to mitigation or cure, and at the final stage rehabilitation. Inputs needed to reduce degradation increase with the stage of declining productivity and increasing degradation.

The WOCAT database of technologies and approaches is easily accessible in Google Earth: there are 51 countries with case studies on 241 technologies and 137 approaches.

Decision support for selecting SLM practices using the WOCAT-DESIRE methodology consists of three stages: identification (this uses a participatory learning approach), assessment (this uses the standardized questionnaires for technologies and approaches) and selection (in a participatory setting).

The standardized tools provided by WOCAT are well tested and introduced in numerous countries and contexts, for example within the LADA and DESIRE projects. The tools are freely available in different languages.

### *4. Research challenges*

There are several challenges to research on SLM. Firstly there is little information on the areal extent of land degradation and improvement. Therefore satellite images and ground truthing are needed. Likewise, we know little about where SLM practices have been applied, and what their impacts are. A current example is: can we assess effects from mulching on water loss in dry areas? Continued monitoring and modeling of time sequences of phenomena of land degradation and improvement is required to provide scientific evidence of these phenomena, e.g. by recording water stages and tracing influences of land use. Also, improved knowledge on costs and benefits of SLM is needed. With regard to adaptation and innovation processes, we should know more about how people take up information on SLM strategies. In any effort to implement SLM strategies, we should try to connect implementing agencies, and always look for combinations of ministries, universities and projects. Finally, students can play a vital role in research on SLM.

### *5. Global issues*

Global issues of concern nowadays are poverty, land productivity, and carbon and climate change. The necessity to adapt to climate change in many parts of the world provides a key topic to learn from experiences in SLM: how tolerant are SLM practices to increased temperature, heavy rainfall events, prolonged droughts?

### *6. Conclusion*

There is a wealth of knowledge on SLM. There are existing and proven methods and tools. We need good data but are lacking resources to get these. The way forward entails WOCAT to become a platform, to join forces for the benefit of SLM, like the collaboration between DESIRE, LADA and WOCAT, and mainstreaming in ongoing programs.

### Questions

Is there information on the period of investment to wait for benefits? Response: in dry areas the possibility to increase water use efficiency and fertility immediately shows results in crop yields. In wet areas, where you are already at maximum productivity which is declining, it may be more difficult to prove return on investment.



**Left:** Introduction of WOCAT by Hanspeter Liniger. **Right:** Coen Ritsema representing the DESIRE-project (photos: Ch.Hauert)

## **DESIRE – A methodology for selecting and assessing land management strategies to remediate degradation and desertification**

*Prof. Coen Ritsema, Coordinator DESIRE, Alterra, Wageningen University and Research Centre, The Netherlands*

DESIRE is a large integrated project funded by the European Union (Directorate General Research) within the 6<sup>th</sup> Framework Program (FP6), and co-funded by national governments. DESIRE is a scientific project and therefore different from projects through EuropeAid, which are more development driven.

What has been done in the past to remediate desertification? In the past 10-15 years at least 40 large international research projects have been executed related to land degradation, desertification and SLM in the EU and in Northern Africa. Relatively few projects were devoted to remediation and prevention of land degradation and desertification, and to information exchange. DESIRE was initiated in response to this deficiency. 26 partners are involved, from 16 countries in the world. The partners have different backgrounds (universities, research institutes, governmental departments, NGOs), expertise (e.g. earth science, geography, eco-engineering, economy, communication science), facilities (GIS, remote sensing, experimental farms, laboratories, knowledge and database platforms) and approaches (technical, social, political, economic).

The main aims of DESIRE are to develop and test promising land use and management strategies to prevent and remediate desertification and land degradation in 16 hot spots in the world, in close collaboration with stakeholders, and to disseminate results through a harmonized information system. DESIRE intends to achieve scientific innovation, and to have impact and outreach at different levels of society. There are 16 different sites with different problems, ranging from water erosion, salinization, forest fires to overgrazing. DESIRE is built on 6 working blocks: 1. context setting, 2. estimating risks of desertification, 3. identifying, documenting and selecting most promising strategies, 4. testing strategies in the field, 5. regional assessment of strategies, and 6. disseminating project results.

The scientific innovation in working block (WB) 1 consists of mapping all study sites using an updated and improved LADA-WOCAT mapping procedure. The work results in maps of the current state of

degradation and conservation, which can be compared between sites. The scientific innovation in WB2 is the development of an extended indicator-based risk analysis tool to be applied in each of the study sites, developed in a previous EU funded project. The tool has been expanded to address the desertification problems in areas outside the Mediterranean. The scientific innovation of WB3 is the development and application of a participatory process for the identification, sharing and negotiation of sustainable land management strategies. The methodology builds a.o. on the WOCAT framework of SLM technologies and approaches. The scientific innovation of WB4 consists in the execution of field trials to test the biophysical and socio economic effects of technologies and approaches selected by the stakeholders in the study sites. This will hopefully lead to success to combat desertification with benefit for local livelihoods. WB5 is innovative in coupling a multi-scale biophysical model to an economic model to evaluate effects of technologies and approaches regarding degradation and desertification, and to perform costs benefit analyses. This results in a tool to assess the potential of technologies and approaches on a wider scale. In WB6 results are already being disseminated using a harmonized webbased information system. Messages to stakeholders are presented at three levels of complexity.

Apart from the local and regional levels, DESIRE intends to address the national level by linking results from WB4 and 5 to UNCCD National Action Plans, and to advise national focal points how to adapt and improve NAPs according to stakeholder needs. DESIRE will initiate proposals with national focal points and governments for wide scale implementation (GEF, IFAD, UNEP). At the international level DESIRE actively promotes the LADA-WOCAT-DESIRE method as a tool to contribute to achieving aims of the UNCCD 10-y strategic plan.

#### *Questions*

(Miloud Chaker): what is the importance and the representativeness of the sites chosen in the project? They are small and vary widely between them. Response: selection of sites has been done by partners in the joining countries based on their experience. Indeed we are working in small areas, however some are larger, and we realize that it is only a selection, not aiming to represent all forms of land degradation existing in the world. Still, we are trying to grasp parts of these in different places in the world.

## **Making use of SLM assessments at the local level**

### **The cork oak assisted regeneration versus other forest techniques**

*Abdellah Laouina, Miloud Chaker, Mohammed Aderghal, Rachida Nafaa, Jamal Al Karkouri, Mostafa Antari, Issam Machmachi, Yousra Laghazi, et Nadia Machouri - the Moroccan DESIRE team, Chaire UNESCO-GN, Rabat*

The presentation gives examples of assessed SLM technologies and approaches trialed in the Moroccan study site in the DESIRE project. The problem of land degradation is that a rapid retreat of the cork oak forest occurs, with a reduction of the vegetation cover, non-regeneration of cork oak, and the increase of poor species. There are several techniques to reduce forest degradation. An example is forest protection and management to reduce the pressure on the forest, and to plan the use and exploitation of forest resources. This could be done by dividing the area in squares. Still, the cork oak appears not easily to regenerate. Another technique used is the plantation of exotic fast growing species like pine and eucalyptus, to improve the wood yield. But this can have negative impacts, like runoff generation. Another option is to regenerate cork oak assisted plantations in degraded areas. The benefits include assured regeneration and improved yield, and reduced land degradation, by the decrease of runoff. The plantation was a success, but after 10 years, the growth of the trees was hampered due to the competition with cistus shrubs. After 5 years, the cover with grass species becomes important.

Assessment of the techniques was made by comparison of various covers and degrees of grazing, and no intervention, using different degrees of vegetation density. As indicators were used the density of trees, shrubs, herbs and litter. In the rainy year of comparison, herbaceous, perennial and annuals are better represented. Biomass and diversity of species were also used as indicators. In the regenerated plots the herbs and shrubs are important. Opening the plots to grazing leads to the decrease of the density of

herbs. The trials with pine and eucalypt were the poorest in producing fodder. Opening to grazing lead to an increase of unpalatable herbs. The density of shrubs and herbs increased in the natural forest with the number of trees. Also penetration resistance was measured as a function of the degree of pasture. The penetration resistance increased with the level of grazing. Soil humidity after rain was lower in the plot open to grazing, partly due to less infiltration, also due to a larger use of water by shrubs. The infiltration curves are lower in grazed plots, and comparable to infiltration characteristics of bare soil. The grazed plot produced more runoff than the protected soil during rainfall simulations. Overall, it could be concluded that the pressure on the forest by grazing leads to less density cover, a lower quality of the cover in terms of producing wood and fodder, and a larger sensitivity to rain intensity, more runoff and less infiltration. The regeneration of cork oak appeared to be a more interesting technique compared to the planting of pine and eucalypt.

#### *Socio-economic assessment*

A constraint to the implementation of SLM strategies in the cork oak forest is that the forest belongs to the state, and that the inhabitants are considered as users with limited rights. For the population the most efficient management is the assisted regeneration, but its implementation is limited due to the costs and the need to open grazing areas elsewhere. The results of the assessment were not sufficient to orient a solution.

#### *Conclusion*

In the region, the main constraint to livelihoods is the availability of fodder for livestock. The forest provides an important part of the needs as long as it is well managed. Degradation of the vegetation cover leads to less income (cork, fire wood, fodder) and at the same time to less stability of the land.

#### *Questions*

(Stephan Mantel:) what is the economic rentability of cork oak? And is eucalypt usable in catchments as an SLM strategy, knowing that it is water consuming? Response: cork oak is a high income production in this area, at the same time it provides wood. Cork can be harvested every 7 years. For wood a longer period is required, but the wood is of good quality for using as fuel. In a small watershed to choose between plantation between eucalypt or cork oak, one should realize that eucalypt can be planted in small patches, but not on a large scale, without impacting water availability.

(Sally Bunning: ) Have you tested the opportunity of the local community to benefit from the cork oak, as an alternative to grazing? Response: the forest is owned by the state, but income from the forest goes to the population through the municipality, which can give it to the local community to invest in projects. But often money goes into mechanistic projects, and it is not sure if it always reaches the population. The Forest Community is now discussing the larger participation of the community in income generation from the forest.



**Left:** Joris de Vente about SLM in the Guadalentin basin. **Right:** Presentation by Mark Reed on how to use local and scientific knowledge for monitoring and assessment. (photos: HP.Liniger)

## **A participatory approach towards sustainable land management in the Guadalentin basin (Spain)**

*Joris de Vente, Albert Solé, Jorge López, Carolina Boix - Estación Experimental de Zonas Áridas (EEZA-CSIC), Spain*

The motivation to apply the participatory approach in the DESIRE study site in Spain comes from the experience with top-down approaches, without concern of addressing land users. The aim of the approach is to look for collaboration between stakeholder groups in sustainable land management. The objectives were to 1. combine local knowledge and science to select feasible effective and socially accepted land management options, 2. facilitate mutual learning, and 3. implement, monitor and select strategies to strengthen social acceptance. The methodology consists of three steps: 1. identify SLM strategies in a stakeholder workshop, 2. Assess and document strategies, and 3. select options for SLM, and implement SLM strategies in the field.

The Guadalentin Basin comprises 3300 km<sup>2</sup>, and receives 300-500 mm rain per year. It has been subject to human influence for centuries. It consists of 15 municipalities and 2 autonomous regions.

The 1<sup>st</sup> stakeholder workshop of step 1 gathered farmers, government officials and scientists. A series of exercises was used to guide the learning and interaction process. These included the identification of problems, using photos, cycles, external factors, evaluation of options, and synthesis towards SLM strategy. 19 SLM options were identified. These were evaluated in the group. Thereafter each individual voted, which resulted in a short list of options. Farmers and non-farmers appeared to vote differently. The main objectives for SLM were formulated, indicating how to implement measures, with which approach, and who should do it. This was used as input to the 2<sup>nd</sup> workshop as the main objective for SLM.

In step 2, the SLM options evaluated with the WOCAT questionnaires on SLM technologies and approaches were: reduced contour tillage, vegetated earthen-terraces, ecological agriculture, organic mulch and traditional water harvesting ('Boquera').

In step 3 multi-criteria decision making for SLM was realized in a 2<sup>nd</sup> stakeholder workshop. The exercises used were: 1. Identifying objectives, 2. Pre-selecting options, 3. Defining criteria (ecological, economic and socio cultural), 4. Scoring of options, and 5. Decision making. The group used 20 criteria, which were grouped into 3 groups of top 4 criteria. Examples: reduce production costs and effort. The number of votes on a criterion determined the weight of the criterion in the decision making. Participants evaluated the pre-selected options against these criteria in stakeholder groups (farmers and non-farmers). This resulted in a scoring matrix. Generally the two groups scored similarly on the options. The scores were put in a multi-criteria decision support system. The ranges of acceptability were displayed for each option in economic, ecological and socio cultural respect, and in a final ranking. The vegetated earthen terrace scored highest, with water harvesting and reduced tillage. Then the result was taken back into the group for discussion. Participants found it difficult to choose between options because they felt that combinations of options would be more effective. A final selection of strategies was made. The next step included the field implementation and monitoring the SLM measures. Stakeholder involvement is maintained during this process. On the site, demonstration and dissemination of experimental results is taking place.

### *Conclusions and lessons learned for SLM*

Participants seemed convinced about the need to maintain soil as a valuable resource. Most farmers were willing to apply conservation measures, but expressed the need for support for implementation. A regional strategy and implementation approach is therefore crucial. There was disagreement between stakeholder groups on which measures would be feasible. Farmer organizations should play a key role for training and support for SLM implementation. Furthermore it was found that a combination of measures is preferred over the selection of single measures. Stakeholders were suspicious on the use of

the software for decision support, and therefore these tools should be transparent. The tool however stimulated an effective discussion. Finally, it was found crucial to have a diverse group of stakeholders.

## Linking science with development

### How can we base monitoring and assessment of degradation and SLM on both local and scientific knowledge?

*Dr. Mark Reed, DSD Consortium WGIII, DESIRE project, University of Aberdeen, UK*

#### *Introduction*

Can we base monitoring and assessment of land degradation and SLM on both local and scientific knowledge? We should not overlook the knowledge of local communities, accumulated over generations. The text of the UNCCD is unique in the way it values local knowledge. But how actually can we incorporate local knowledge to enforce decision making? Some argue that local knowledge is not reliable enough. We need to critically assess knowledge available to us, and draw on the most relevant.

#### *Where does the science stand?*

We are at an important point in the history of science (including social and political science). The research community is well connected internationally, through internet, and research is increasingly weaving together interdisciplinary work on complex and dynamic systems. Enormous amounts of money are pumped into this sort of research. The natural sciences are providing means to assess land degradation and SLM. We have also learned to work more effectively with communities on the ground. However, there has been disillusion on participatory work, and at the same time there is new consensus on best practices.

#### *Where are the gaps?*

Why are we monitoring and assessing, and for whom? M&A can also be shared through the use of indicators and M&A frameworks. The international community wants minimum sets of indicators, but if this information should help people on the ground, then it must be supplemented with local indicators that land managers can monitor and act on themselves.

The framework for the DESIRE method comprises 4 key elements: first establishing contexts, next identify, evaluate and select SLM strategies, subsequently identify, evaluate and select indicators, and finally apply SLM options and monitor them. DESIRE is one way in which this framework is put into practice. In the last meeting of the UNCCD parties (COP 9) two indicators have been adopted to monitor progress towards the implementation of the 10 year strategic plan in countries. We have the ability to supplement the international set with local indicator sets. Modelling is not always required; there are examples from national systems in Namibia and Australia, where data are collected at regional or federal levels with a nation-wide coverage.

Getting the right policy and socio cultural environments is just as important as creating the technology environment. We need to build on and document existing work and explore new mechanisms that can enable land managers to do monitoring and assessment. One way to do this is to supplement international sets of indicators with sets of locally relevant indicators.

## **Pilot Basins for Green Water Credits and the linkage to WOCAT**

*Sjef Kauffman, ISRIC World Soil Information and Samir Rgaouti, Agence du Bassin Hydraulique du Sebou*

The Green Water Credits project receives funding by IFAD, the Swiss Development Cooperation, and the Stockholm Environment Institute. Demonstration basins are the Tana basin in Kenya and the Sebou basin in Morocco.

Why do we use the term 'green water'? Blue water is the liquid water that is pumpable. Green water is the rain water which enters the soils, and returns to the atmosphere in vapor form (evapotranspiration). The term was introduced in 1994, and directly accepted by a large audience as a term to attract attention from policy makers. The attention to improved soil water management in rainfed agriculture is core to the Green Water Credits. The second key aspect is facilitating farmers to do this.

Starting points in the Green Water Credits philosophy are that the key resource for green water is rain water. The farmer can improve the local water balance. Upstream land management is linked to downstream water availability. A lot of policy makers do not realize this. Farmers are key and need support to make investments. How can we support them?

The main steps include: if upstream land uses cover >25% of the basin area, then there is scope for the improvement of green water use. A downstream water use analysis (urban, industrial, agricultural, hydropower) includes the current water use and trends. Green Water Credits looks at 4 domains: soil and water management, livelihoods, institutions and regulations and financial mechanisms. How and where do we have water scarcity? There are different types: physical, economic. It is high time to do something. Who are the key players? Water suppliers or regulators, farmers of rainfed agricultural land and forest users. Users are urban areas and others. Farmers are the ones to realize GWC and need support. There is much scope for improvement.

Global flows of blue and green water indicate that of 100% rainwater, 30% is going to blue water, and all the rest to green water, the largest part by grassland. More water cannot be created, but green water resources can be better managed. The only win situation is to reduce evaporation. This can be done by better soil and water management. GWC bridges the incentive gap by regular compensation from water users towards water providers for specified water management services. The benefits are more water, and less sediments.

GWC is a financial facility to support farmers to make initial investments for proper green water management and to maintain these. The GWC financial mechanism is based on the benefits for downstream users. Targets are more blue water downstream, improved water quality, arresting siltation, and regulated water downstream. The economic benefits for Kenya amount to 33 million \$ annually, against implementation costs of \$ 10 million, and annual maintenance costs of \$ 2 million.

The Sebou basin in Morocco has the largest irrigation schemes of Morocco. Hydro electric power is important, dry areas occur. Large towns use blue water from the river (e.g. Casablanca). The green water balance accounts for 77% of the rain water. Rainfed land use is 35% of the area, and forest 30%.

### *Conclusions*

GWC creates a market in water management services that supports rural livelihoods. The first aim is to get science and knowledge implemented, and the second aim is to support farmers to do so.

## Assessing soil erosion and conservation with various methodologies at different scales

Issam Machmachi, on behalf of the Moroccan DESIRE team

The Sehoul community is part of the Central Moroccan Plateau. There is marginal land with high poverty and land degradation. It is characterized by variability and chronic shortage of natural resources.

The SLM technologies and approaches assessed included: olive groves with annual cultivation, crop rotation cereal/leguminous, fodder cultivation and regeneration of cork oak. Various measurement techniques were used for vegetation, soil surface state measurements, soil fertility and water balance components. The cereal/leguminous rotation increased soil protection by providing better cover, also better organic matter, and N rates. The soil structure (measured by penetration resistance and soil cohesion) was improved. In the olive groves with annual cultivation the herbaceous cover increased, and soil moisture and organic matter content increased. For the fodder cultivation technique, lupine appeared to offer the best cover.

Soil erosion was assessed by 137 Cs measurements in three transects on different rotations. The highest erosion rates were found in barley wheat rotations. Soil loss and the runoff coefficient under different land uses were highest on bare, very stony soils, and pasture land.

The Hannanat catchment was used for trial catchment experiments to follow up effects of vegetation growth on runoff. Vegetation cover is highest in spring in cereals. The hydrological behavior is characterized by quick flood responses in autumn, with peak discharges around several hundreds of l/s and runoff coefficients RC up to 54%. In winter, rainfall-runoff events are of longer duration, and runoff coefficients smaller. Surface runoff and soil erosion will be modeled using the LISEM model. This will enable to imagine scenarios of functioning of the catchment.

The plot and catchment experiments lead to the conclusion that the crop rotation cereal/leguminous is a good strategy for SLM, but needs to provide fodder.



**Left:** Issam Machmachi presenting results of the Moroccan DESIRE-team. **Right:** Sally Bunning introducing the LADA-Approach for assessing land degradation and conservation. (photos: HP.Lingier)

## LADA local: a local level assessment toolbox for assessing impacts and monitoring and decision making

Sally Bunning, FAO -Land and Water Division, (drawing on experiences of Senegal, Tunisia and South Africa)

The objectives of the local assessment method of LADA are to provide a toolbox for assessing and analyzing land degradation and improvement at local level, to provide an integrated understanding of

causes and impacts of land degradation and the effectiveness of SLM, of constraints to adoption of SLM measures, to provide a baseline for monitoring land degradation and SLM, and to use findings for decision making. The focus is on drylands. The method is developed with 6 pilot countries. LADA-Local is a participatory, integrated approach. There is a biophysical and socio-economic assessment, and a joint analysis with local experts.

Selection of assessment and study areas: example of Senegal. A land use systems map and land degradation map are prepared through an expert process, leading to the identification of sites for further investigation. Steps include training local experts, collecting available data, forming a team with district stakeholders, then to characterize communities on the ground. This refers to the problems of LDD in the area, the actual and potential SLM and community strategies, the perspectives of the community, institutional policy factors and trends. The characterization is done by carrying out transects, to understand which degradation types and processes and which measures on which land would be suitable. These depend on the aims to do either prevention, mitigation (stop or slow negative effects) or rehabilitation of land degradation and desertification. WOCAT tools are used for assessment. Other tools include transect exercises, vegetation surveys, focus group discussions, and technical expertise. The socio economic study is an important part of the local assessment, leading to recommendations for land users and policy makers. An analysis of actual responses to land degradation in the study area is part of the socio economic study. The effectiveness of different techniques is valued. The extent of the adoption by land users and constraints are listed for different SLM strategies.

The DPSIR framework is used in LADA-Local to analyze causes and driving forces of land degradation and SLM. A key issue is population pressure. An analysis of impacts on livelihoods is part of the framework. Land user groups are visualized in terms of their different assets (e.g. human capital, natural capital, financial capital). Impacts on ecosystem services are also analyzed. These include productive, ecological and socio economic services. Upscaling from land unit to the landscape level is done to analyze effects of land degradation and SLM on wider ecosystem functions in the watershed or landscape. An example from urban sprawl in Tunisia is shown. Effects include climate change, water cycle effects, and effects on organic matter and nutrients.

A key issue in the LADA-Local method is reporting back to communities and discussing findings with them. It is important to bring results up to policy makers, among national institutions in an interactive multi-disciplinary review process.

#### Conclusion

A set of LADA-WOCAT tools is available to support local to national decision making. This includes the LADA Local Assessment Toolbox, the WOCAT questionnaires on technologies and approaches, the land use systems mapping, the sub-national land degradation and SLM assessment using the WOCAT mapping questionnaire, and the decision support tools at local and regional level (WOCAT-DESIRE method, FAO dynamic maps). These tools are intended to improve knowledge, to assist countries in monitoring progress in the implementation of their UNCCD NAPs, and to target investments in SLM. There is a need to convince policy makers that investing more in SLM is useful.

#### Questions

How is the local scale assessment upscaled to the national level assessment? Response: this is done through the land use systems map, in a qualitative upscaling procedure. It looks at trends, not measurements.

## SLM benefits beyond the local scale

### Mapping the Unknown – The extent of Sustainable Land Management

*Godert van Lynden – ISRIC World Soil Information, The Netherlands*

We already know a lot about land degradation, and a lot of money is invested in SLM, but it is not known where. There are no maps on SLM activities other than the ones created in the LADA and DESIRE projects. Information on WOCAT mapping is on the WOCAT website, and locations of WOCAT cases of SLM can be viewed in Google Earth, but that only gives you geographical locations.

The questionnaire on SLM mapping is actually the manual on mapping land degradation and SLM jointly developed in WOCAT, LADA and DESIRE. The method has been revised and tested in 6 LADA pilot countries, in Tadjikistan and Switzerland, and current applications in the 16 study sites of the DESIRE project. The mapping units are those of the Land Use System, and the mapped responses are the type and degree of land degradation and SLM, trends in areal extent of the land use system, trends in the intensity of the degradation and conservation phenomena, impacts on ecosystem services, direct and indirect causes and recommendations. The WOCAT mapping is assessing the existing, current practice, not what is recommendable. A new mapping database has recently been developed, which allows to access and edit attribute data and maps through the internet. The (interactive) data viewer is under development.

### Mapping the spatial assessment of degradation and conservation

*H. Taamallah, M. Ouessar, I. Enneb and M. Chitner - IRA Medenine, Tunisia*

The presentation covers experience with the WOCAT mapping in Tunisia in the framework of the DESIRE project. The study site covers 300 km<sup>2</sup>. The land use system in the area consists of steppes, rangelands in mountain areas, rangelands in plain, saline vegetation, olives, and annual cereals.

#### *Cereal agriculture*

The cereal agriculture land use system is kept fallow during dry years. The areal trend is positive, because people try to extend the area of cereals. There are some controls by the government, but the land use is not easy to control. The expert recommendation for mitigation is to reduce vegetation cover degradation through sand fixation and soil and water conservation. For prevention, the recommendation is to use practices to restore the vegetation cover. Information on techniques is stored in the map database with regard to sand stabilization and tabias.

#### *Agriculture behind jessour*

The jessour system is an old water harvesting technique adapted to the region. Olives are grown behind water harvesting structures. The main processes are water erosion and drought, and removal of vegetation. The expert recommendation is to intensify water and conservation works for mitigation, and for prevention to ensure maintenance and to safeguard SWC works

#### *Plain rangelands*

This land use system is decreasing in area and intensity due to problems with land ownership. Problems include overgrazing, due to the decline of the grazing area, erosion and removal of vegetation. Techniques used are fencing, resting, afforestation, and sand dune fixation.

#### *Dahar rangelands*

These are collective lands. The main problem is wind erosion, overgrazing, and the collection of food (e.g. herbs for cooking).

The land use systems 'agriculture behind tabia' and 'halophyte rangelands' are used for common grazing. This happens in the downstream part. Due to water harvesting in the upstream part the downstream areas are receiving less runoff.

#### Questions

How does the method deal with the difference in scale between the DESIRE study sites? Response: to overcome the problem of scale, units were chosen to correspond to administrative units. The method uses fixed map units, because otherwise it would be necessary to create new units for any mapped layer (e.g. degradation, conservation). If there is only 5% coverage of a land use system, then perhaps the map units were chosen too big, and should be selected to correspond better to the size of the study site. Generally, between 30-100 units are recommended for an area to be mapped.

The method does not allow to locate the variables mapped within units (e.g. extent of degradation). This is true, but the method asks for the type of degradation addressed. If there are terraces against water erosion, it indicates that there was water erosion, which maybe has been relieved due to the technology.



**Left:** Short introduction of the WOCAT-LADA-DESIRE Mapping approach by Godert van Lynden.  
**Right:** Mohammed Ouessar presenting mapping results of Tunisia. (photos: HP.Liniger)

## Assessing land degradation and conservation in Somalia

The Somalia Water and Land Information Management Project (SWALIM)

L. Njeru, R. Vagas and C. Omuto, FAO-SWALIM, Nairobi, Kenya

### Ecology & livelihoods

The central and northern parts of Somalia are dry, and receive 100-250 and 300-500 mm/y. There are no regulations against wood cutting. Pastoralism, oasis farming, wood collection, and charcoal production are the major means of existence. The southern region is wetter, receiving 400-600 mm of rain per year. There is pastoralism, agro-pastoralism, rainfed and irrigated farming and wood collection. The challenge to land degradation is that there is no government at the moment, which exacerbates the situation. There is a heavy pressure on the land due to overgrazing and charcoal production. Traditional land management systems are breaking down, and the environment is already a marginal environment by its nature. In the south of Somalia the degradation is worse than in the north, because in the north there is some authority from community elders on natural resources.

Assessments of land degradation are available from remote sensing analysis. The challenge is that communities want a bigger picture of the situation. They want to know the state of the problem, the spread and intensity; causes of the problem, impacts on people and environment, what is being done or can be done. This led to the use of WOCAT mapping to map land degradation. Supporting data were

compiled to create and validate the land use systems map (biophysical characteristics and livelihoods), and the map was verified by field experts. Participatory assessments were conducted in several parts of the country. The whole process resulted in a compiled list with land degradation data, with degradation types, extent and degree of degradation, direct causes, indirect causes and impacts on the ecosystems. The map of land degradation classes, shows areas with strong degradation, also in the wetter parts of the country in the South. This results also from the political situation; the resources are open to anyone. There are few management practices across the country, but there are some successful practices available.

### *Conclusions*

The WOCAT mapping method is a good tool for mapping degradation and conservation. However, good preparation is needed, and a good base map and supporting data. Adequate time is needed for the assessment. The land degradation dataset for Somalia is now available; it may help to arrive at consensus, given that there is so much disagreement on the extent and state of land degradation in the country. People intermediate between the project and the communities are well educated; this ascertains that the products of the tools are well conveyed to the community. Therefore there are good chances that the information will guide land degradation and conservation interventions. At the community level the LADA local assessment and WOCAT database and tools could be used.



**Left:** Presentation of FAO-SWALIM by Lewis Njeru. **Right:** Round table discussion (photos: HP.Lingier)

## **Round table discussion**

*With Dr. Hanspeter Liniger, Prof. Abdellah Laouina, and Prof. Coen Ritsema*

### **What are key issues for assessing the benefits of SLM for you?**

Hanspeter Liniger: the first thing we must know is about the benefits of SLM. Many times statements are made on that. Then benefits in terms of water, but also in terms of biodiversity. The challenge is that we need to be able to quantify benefits.

Key issues:

1. Any investment related to improved water or fertility must show in terms of productivity
2. Climate change is a key issue, yes we can easily use it: how can SLM contribute towards mitigating climate change by putting more C in the soil. I do not have the answers, for different practices and climates. Adaptation to climate variability: how are people coping with more extreme events. To prepare ourselves for the next decades to come.
3. We must look for win-win solutions.

Prof. Ritsema: we must distinguish effects of SLM between effects on environment and effects on people. The former are well listed, also on ecosystem services. Effects on people like the improvement of yields and income, we all know, but how to quantify those impacts?

Prof. Laouina: there is a focus on methodology in this conference. The presentations tried to find complementarity between scientific methods for assessment and the knowledge coming from populations. We cannot say that the local knowledge can replace assessments made in the field. Key issue here is to be able to work with people with a special standard of knowledge. An investment is needed to increase the knowledge among the population. Any action in the field should be preceded by investment in education, poverty alleviation, and increase of knowledge of the population.

Prof. Ritsema: if we find suitable strategies for SLM in the world, how do we convince stakeholders that things need to be changed in a certain direction? Beyond the ongoing discussions between scientists, communities, and NGOs, to national governments? Is what we do in our projects sufficient to convince people on the local and national level to change things?

Sjef Kauffman adds to the last point of the danger to remain with a situation with educated people but no follow-up. The challenge is not only to deliver these projects, but to combine forces to formulate implementation programs. Science should accompany this implementation. Also moving from studying the small scale, to assist large scale implementation programs.

Victor Jetten: Land degradation is considered as a rural problem, although the largest part of the population lives in cities, so the pressure on rural areas will be only increasing. Perhaps economic calculations of the value of soil compared to other resources may be more effective than promoting carbon sequestration.

Miloud Chaker: we should validate local knowledge, it is a way of living jointly with the environment. Recent changes have shaken the local knowledge; choices of local communities are made under pressures by a changing environment, rather than based on their knowledge. In Morocco there are experiences with farmers willing to follow SLM strategies, but abandoned certain choices because of the increased velocity of change of landscapes and socio economic environments.

Stephan Mantel: Perhaps the diversity and complexity of each of the study sites in the DESIRE project is that large that it may perhaps be very difficult to come up with general recommendations which go across different environments. So maybe we must concentrate on the local lessons learned.

#### **How can we join forces to combine programs (such as DESIRE, WOCAT, LADA)?**

Prof. Ritsema: What we are doing right now is an effective way to combine available knowledge, which we should expose to the world. We are gaining visibility also at the governmental and UNCCD level. Maybe need to somehow brand the combined methods in a professional way to push it into the future. Let's sit down with critical players to draw up a business plan to generate funds to continue the work that we are doing now, in the direction of governments, UNCCD, and link it to the climate change process. The train where we are sitting on should not slow down in the next years.

Prof. Laouina: There is stratification of progress, as WOCAT was followed by LADA and DESIRE. Also of words used: Water and conservation, then NRM, now SLM. Concepts are extending. At the same time we see that the consortia are in some common countries, like in Tunisia, where is worked with all three methods. The teams are different. The programs are not always owned by the decision makers and the technicians in the country. For example in Morocco we tried to convince decision makers and technicians to adopt the methods, which was very difficult. If we want to make these methodologies adopted by decision makers in our countries, we remain a group of researchers, but the meaning is less if it is not adopted.

Prof. Liniger: WOCAT, LADA and DESIRE have shown the way forward. Can make our lives easier. We gained a lot from the combination. It is not only the content that brings the workers together, but also commitment. Much of the efforts are based on personal commitments. How can we join efforts? If that mentality exists in all the countries as well, we can move in the right directions. But we also need to approach the donors, the big guys. They also need to join forces. Why is UNCCD doing things which are almost the same as GEF? We must convince them that joining forces makes the work a lot easier.

Mark Reed: This is an exciting time where communities and agendas are converging. On the DSD 1<sup>st</sup> scientific conference coming together, the 3 working groups appeared to have worked in isolation, yet came up with similar ideas. So there is a convergence among scientists. In the policy forming community there is a new receptivity to working with scientists. And then thirdly in the increasing convergence in the work of NGOs and scientists. There are four tangible ways to do that: 1. Academic, around common proposals, 2. Papers coming out from the conference, 3. Policy: getting involved in the preparation of the next CST, and 4. CSOs: follow up on the Drynet initiative.

Godert van Lynden: Let's not forget that there are a big number of projects behind the research initiatives WOCAT, LADA, and DESIRE. If we would list that consortium and present that to donors and saying, look at this consortium and network of partners working behind the three big programs.

Sally Bunning: In the past we have been addressing land degradation as the aim of soil and water conservation. Now we are moving to addressing land degradation in a multi-sectoral approach, where SLM is addressing productivity and food security, sustainable use and working with the environment, agriculture, livestock and water. That is where the biggest challenge is, not on the ground but at the national level. We can work with different partners to break barriers between sectors.

### **What is your main conclusion of the day?**

Prof. Laouina: We should improve assessment by re-enforcing the anthropological and socio-economical explanation of the consequences of SLM technologies and approaches and their spatial distribution. For any of the steps in the assessments the biophysical considerations are thorough. But for the socio-economic aspects they remained superficial. There should be more attention to the process of adoption. This could improve assessments of LD and SLM.

Prof. Ritsema: let's grab the momentum we have, push the LADA-DESIRE-WOCAT method forward, more than we do now. Questions: we are considering all thinkable and existing technologies and approaches, but we might also think differently, and need to avoid that people tell us in the end of the project that we repeat things that have already been done for years (like contour ploughing, mulching). Do we convince sufficiently national governments to undertake measures on the ground? Do we have sufficient aggregates in our consortium to convince these people to take decisions?

Prof. Liniger: Our work, our tools need to help to advance SLM practices in the field. Unless we can show that there is spread of SLM, and that LD is going down, then we fail. The only possibility to convince is by having arguments that land management should change. We have the tools and possibilities at hand that work at all levels to make strong enough arguments to show that these impacts or benefits are there, and that they are useful for anybody. That is where we are still behind.

Technologies versus approaches: both have to work, not one is more important than the other. The other point is that of change: technology and approach should be constantly adaptable. We must look around what people are already doing, it is just often that we don't recognize this. The way of working that we do should become the day to day approach. This would be a major achievement.

Patrice Burger: We were the CSOs that have pushed a lot to get the science considered in the CST, and the DSD conference was the first step in 30 years of decision making without science. Drynet is a consortium of CSOs; in a next meeting we should try to connect to it. Einstein said: when a problem is persistent, despite all efforts to solve it, there is a need to reconsider our thought. In this exercise imagination is more important than knowledge.

Jan de Graaff: Compliments for the collaboration between the 3 projects, and to keep on inviting donors.

Gudrun Schwilch closes the symposium by thanking the three programs, translators, dean of the faculty for providing the lunch, and Prof. Laouina and his team for the excellent organization of the symposium.