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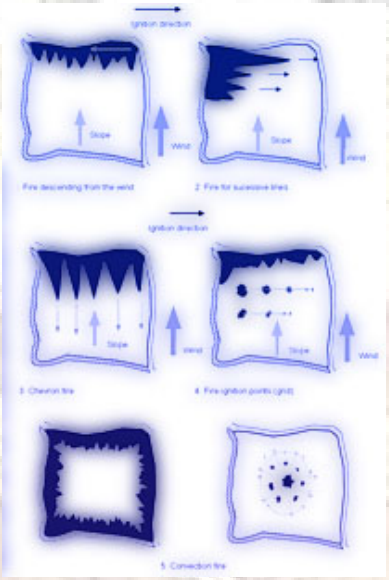

A list of recommended remediation strategies within each region for policy-makers and extensionists

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DESIRE

DESERTIFICATION MITIGATION AND REMEDIATION OF LAND – A GLOBAL APPROACH FOR LOCAL SOLUTIONS

Deliverable 5.4.1

A list of recommended remediation strategies within each region for policy-makers and extensionists

Mark Reed, Luuk Fleskens and Lindsay Stringer

Contents

Summary

This report summarises findings from the final workshop that was conducted in each study site to enable stakeholders to review evidence from field trials and models, and use this information to prioritise remediation strategies for regional dissemination. Remediation options had previously been selected by stakeholders, trialled in the field and modelled to assess their likely applicability and cost-effectiveness at a regional scale. A total of 15 workshops were held between July and November 2011. On average, workshops consisted of 27 participants (range: 8-60), and included a wide range of (mainly local and regional) stakeholders representing different interests. Feedback from stakeholders about the workshops was generally very positive with participants in all sites saying that they appreciated receiving feedback from field trials and models. Feedback about the overall DESIRE process was also very positive, with positive feedback focussing on the participatory and inclusive approach to the work. In many cases, evidence from field trials and models supported the initial views of stakeholders, and the priority in which remediation options were ranked by stakeholders changed little in response to the evidence they were presented with. However in some cases, remediation strategies were deselected by workshop participants in response to research findings, for example if model results showed that a technology was unlikely to be cost-effective for most land users, or if field trials showed that proposed remediation strategies were not as effective as stakeholders had initially believed. The process of trialling and modelling remediation strategies clearly influenced stakeholder priorities, and led to a priority list of remediation strategies in each study site for dissemination at a regional scale, by extenionists or other regional government representatives/agencies. However, rather than simply using these research findings to prioritise remediation strategies, the workshop process provided invaluable local knowledge about how best to promote each of these strategies to optimise adoption rates. Rather than simply presenting research findings to decision-makers, the DESIRE process was designed to facilitate knowledge exchange and joint ownership of findings, resulting in a high level of trust and satisfaction in the research findings.

1 Introduction

The DESIRE project has taken a unique approach to tackling land degradation that combines lessons from the latest research with local knowledge (Reed et al., 2011; in press). By involving affected stakeholders from the local area at every stage of the process (from land degradation assessment, to the selection and trialing of remediation technologies and approaches), it is possible to tackle land degradation in a way that meets local needs and priorities. In this way, it should be possible to build capacity for more sustainable land management decisions to be taken on a field-by-field basis. However, scaling these actions up to a regional or national level is not straight-forward. Local conditions may not be representative of conditions in the wider region, and even if a remediation strategy is in theory applicable across a wide spatial area, the likelihood that land owners and managers will adopt a strategy depends on a wide range of other factors (e.g. related to the cost of introducing or maintaining the technology, or related to the context in which the decision to adopt is being taken, such as distance to market).

To better understand their applicability at local scales, remediation strategies suggested by local land users were tested during local field trials (WB4). Information from local land users and (in some cases) preliminary field trial data were then used to develop a combined biophysical and economic model to assess the applicability and cost-effectiveness (and hence in theory, adoptability) of remediation strategies at a regional scale (Deliverable 5.1.1 and 5.1.2). The findings from these models were combined with field trials results, and presented to (mainly local) stakeholders in a series of workshops across DESIRE study sites in 2011. The aim of these workshops was to:

- Share and evaluate results from WB4 trials of remediation options that were prioritised during the previous WB3 workshop;
- Share and evaluate results from WB5 models which show how the remediation options can be applied throughout the local area, taking into account the physical limitations and socio-economic assessment criteria
- Select and/or prioritise remediation options for wider dissemination/application and making lists of recommendations relevant to stakeholders at local, up to national scales, that can facilitate their widespread adoption
- Elicit feedback about the workshop and the wider DESIRE project process from stakeholders

The following section describes how workshops were designed, followed by a summary of workshop outcomes from across the study sites. The report ends by providing detailed workshop reports from each study site.

2 Workshop Design

An initial workshop design was presented at the 2010 DESIRE Plenary Meeting in China for feedback from study sites, and was significantly amended in response to this feedback, to ensure that workshops were flexible enough to work effectively across the full range of project contexts, whilst providing standardised responses for comparison between sites. In particular, the idea of a single workshop with separate (but interlinked) sessions for both local stakeholders and national policymakers was deemed infeasible by most study site teams. Workshops were therefore designed

in most study sites for local/regional stakeholders, and feedback was sought from national policymakers in separate workshops or individual interviews (many of these are ongoing).

To assist study site teams in planning the workshop, a flowchart decision aid and a Frequently Asked Questions list was developed. Preparation for workshops proceeded as follows:

1. Update stakeholder analysis, from which an invitation list can be extracted – these lists were checked by the WB5 team to ensure a good balance between different types of stakeholder
2. Develop facilitation plan and agenda for the workshop, assign the facilitator, book the venue and invite participants so as to achieve an appropriate balance between (local) stakeholders identified in step 1
3. Run the local stakeholder workshop based on the workshop format in Appendix 1, discussing any changes deemed necessary with the WB5 team
4. Conduct interviews/meetings with representative members of the national policymaker stakeholder community identified in the updated stakeholder analysis (policy messages were discussed in the DESIRE Plenary Meeting in Almeria in October 2011 to assist with this)
5. Send workshop report to participants and to WB5 (template provided)

All workshops followed the same generic format (for details, see Appendix 1):

1. Brief presentation to introduce the DESIRE project
2. Presentation of WB4 trial results
3. Presentation of WB5 model outputs
4. Workshop 1: Multi-criteria evaluation of remediation options at study site scale
5. Workshop 2: how could we facilitate the adoption of the priority remediation options that have emerged at the study site scale?
6. Workshop/project evaluation
7. Next steps

3 Discussion of Workshop Outcomes

A total of 15 workshops were held between July and November 2011. The only site that did not hold a workshop was the Italian site, due to long-running difficulties with stakeholder engagement there. In Portugal, one workshop was held with participants from both study areas. On average, workshops consisted of 27 participants (range: 8-60), and included a wide range of (mainly local and regional) stakeholders representing different interests.

Feedback from stakeholders about the workshops was generally very positive with participants in all sites saying that they appreciated receiving feedback from field trials and models (Table 1). Feedback about the overall DESIRE process was also very positive, with positive feedback focussing on the participatory and inclusive approach to the work (Table 2).

A survey of study site teams at the Spanish DESIRE Plenary Meeting in October 2011 found that 54% of study site teams believed that stakeholders were more positive about most technologies after hearing the findings from field trials and models, and 31% were ambiguous about stakeholder responses (either due to a mix of responses or because it was difficult to tell if perceptions of technologies had changed in response to hearing findings). In some cases, remediation strategies

were deselected in response to research findings, for example if model results showed that a technology was unlikely to be cost-effective for most land users, or if field trials showed that proposed remediation strategies were not as effective as stakeholders had initially believed (and in some cases counter-productive).

Table 3 shows how the process of trialling and modelling remediation strategies clearly influenced stakeholder priorities, leading to a priority list of remediation strategies for dissemination at a regional scale, by extenionists or other regional government representatives/agencies. However, rather than simply using these research findings to prioritise remediation strategies, Table 2 shows how the workshop process provided invaluable local knowledge about how best to promote each of these strategies to optimise adoption rates. This builds on evidence from WOCAT that developing "approaches" to soil and water conservation, that may include changes in policy or incentives for example, is as important as the technologies themselves (Schwilch et al., 2009). Table 2 shows the wide range of suggestions made during workshops to help facilitate the adoption of different technologies. These include, for example: the need to adapt technologies to make them relevant in different contexts or for different farmer goals; policy recommendations to create a more favourable economic context for adoption; financial incentives, and a variety of approaches to communication. It may be difficult to do much to change the preferences and constraints of the land users that remediation strategies are targeted at, the cost of adopting a remediation strategy, or to alter the policy or economic climate in which remediation strategies are promoted. However, where remediation strategies are deemed applicable and cost-effective across a wide enough area, the workshop findings suggest that there are a number of key ways in which uptake could be enhanced. For example: there may be ways that remediation strategies can be adapted, packaged or communicated that could enhance their uptake; or key individuals or institutions may be able to play an important role in spreading knowledge and changing attitudes, ultimately leading to more widespread adoption decisions.

Rather than simply presenting research findings to decision-makers, as per the technology transfer paradigm, the DESIRE process was designed to facilitate knowledge exchange and joint ownership of findings. At best, the technology transfer paradigm is an inefficient approach to spreading knowledge of new remediation options, with those who receive the information potentially not engaging with it or questioning its validity or relevance. At worst, a one-way transfer of knowledge can lead to the development of technologies that are not adapted to the local context, leading to low adoption rates and/or unintended consequences. In contrast to this, the DESIRE approach puts local and scientific knowledge on an equal footing, giving stakeholders ownership of the research process via their involvement from the initial stages, through selection and trialling of remediation strategies, to the final decisions about priority remediation strategies for dissemination via extension services at a regional or wider spatial scale. Modelling studies in particular have been widely criticised for creating a "black box" where it is impossible for stakeholders to identify or question the assumptions of the model builder, leading to a lack of trust in the final output (Prell et al., 2007). Being able to question findings from trials and models during the final workshop enabled stakeholders in the DESIRE process to open this "black box", so that evidence based on field trial results and model outputs could be weighted appropriately in their final prioritisation. This resulted in a level of stakeholder trust and satisfaction in the research findings that is unusual in model-based studies, as evidenced by the generally positive feedback from workshop participants re: the contribution that research findings made to their knowledge (see next section).

Table 1: Feedback from participants about the final DESIRE workshop

Theme	Example comments	Number of sites making the comment
An opportunity to express views	• An excellent opportunity to make their views known regarding the national program of soil conservation and the way they think • It was a very good opportunity to debate frankly key issues relevant to the management of the natural resources in the region	3
Helped participants prepare for the future	• Farmers especially welcomed the team's approach to determining future steps through discussion with them	2
An opportunity to learn about the DESIRE research	• An opportunity to know the results of the project that they were part of • You see simple and feasible solutions	2
Learn from and become more tolerant of each other's views	• Learn from participatory projects; tolerance between the different sectors (stakeholders)	1
An opportunity to connect with people and institutions	• Workshops helped them to identify and connect with the institutions and the people who are working with them	1
Clear objectives	• "The objective was very clear"	1

Table 2: Feedback from participants about the overall DESIRE project summarised from workshop reports (feedback in the words of workshop participants is given in quotation marks)

Theme	Example comments	Number of sites making the comment
Benefits of a participatory approach	• The participatory approach gave each group of stakeholders the opportunity to be part of the project and share responsibility for the success of the selected technology • As workshops were open to anyone, the workshops helped to give more transparency to the actions and decisions that arose from the process • Being involved in the project from the beginning • Being able to assess the technologies "will greatly facilitate the extension of the results" • Farmers were very enthusiastic about the undertaken actions • Technicians/engineers appreciated the participatory approach	8

	more than farmers in one site • It is the best way to include all sectors, empathizing with others and getting better understanding of the other peoples opinion • "It facilitates participants to express their opinion" • "The possibility to start a debate over different subjects and that all opinions are valid, independent of from who it originates"	
Poor stakeholder representation	• The only real problem was the difficulty of including some other institutions other than those that typically attended workshops as part of the DESIRE process. Although the project team interacted with these other organisations, it would have been better to have them present more often during the land-user workshops • Participants agreed that a higher participation of farmers is required and that to achieve this, a different approach may be needed with meetings outside in the field and only for maximum half a day • Field work prevented farmers from attending some of the planned meetings • Only one farmer was present at the final workshop in one study site • More participation of farmers is needed, which requires new strategies for participation • More participation of general public (people who do not work in the field) is needed	5
Learning from each other	• Participants indicated they learned a lot from each other, from discussions and from the results of field trials. The interactive approach of workshops was considered effective to achieve interaction between participants, and was highly valued • Learning from other study sites via the HIS • "The DESIRE project has been good. It brought knowledge that we can pass on to younger generations" • "Very enriching, mutual learning" • "[The DESIRE approach] promotes participation, collaboration and helps to better understand" • "Exchange of experiences and generates ideas"	4
Contribution to policy	• "The objectives of the DESIRE project fit in the goals of UNCCD and the positive results should be applied to other watersheds..." • The results of the DESIRE project have been important for a number of programs and actions linked to the Government's Secretariat of the Environment and Natural Resources. A number of proposals have already been accepted, while others are still under development	3

Time-consuming	• All participants agreed that the inclusive nature of the DESIRE project was particularly useful, although it was time-consuming	2
Concerns about follow-up	• Lack of funding for some remediation strategies and future research in the area • Want to continue meeting in such events in future	2
Making connections	• Highly encouraged the synergies between all the partners: research, development, policy, regional and international cooperation • "[The project] integrated different stakeholder groups (farmers, administration, scientists)"	2
Attitudinal change	• "The project changed the attitude of land users regarding the use of natural resources"	1
Lack of trust in research findings	• "The engineers didn't appreciate a lot the research protocol and were suspicious with some of the results"	1
Innovation	• "Very tangible results were provided over solutions that are innovative"	1
Learning between researchers and stakeholders	• "You learn and value other measures" • "I learned that the mulch type as applied in this project did not give the expected results" • "It combines the opinion of scientists and farmers" • "I think this is the best available method to facilitate the active participation between scientists and administration"	1
Information overload	• "Too much information to deal with"	1

Table 3: Remediation options in priority order, as ranked by stakeholders during WB3 workshops (prior to field trials and modelling) and during final workshops (after being presented with results from field trials and models). For detailed descriptions of technologies, see section 4.

Study Site	Priority order pre-results	Priority order post-results	Comments
Cape Verde	1. Small barrage/dam 2. Water harvesting 3. Afforestation 4. Contour stone walls 5. Vegetative barriers	1 Vegetative bunds on steep rainfed arable fields, and vegetation spread across non-sloping fields	Only afforestation and vegetative barriers were evaluated in WB4/5. Vegetative barriers were significantly 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. Pressurized irrigation 3. Drought-resistant crops	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 added to field trials after the WB3 workshop
Turkey (Eskişehir)	1. Planted soil bunds 2. Stone bunds 3. Fanya juu terraces	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 the WB3 workshop
Chile	1. No tillage with subsoiling 2. Agroforestry systems	1. No tillage with subsoiling 2. Crop rotation with legumes	

	3. Crop rotation with legumes	3. Agroforestry systems	
China	1. Check dams 2. Reforestation 3. Terraces	1. Check dams 2. Reforestation 3. 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. Supplement irrigation =4. Stone ridges =4. Cisterns 5. Range resting 6. Medicinal herbal and aromatic plants	=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. The improved system based on cereal cropping with rotation, plus grass strips 2. The improved system based on grazing and cereal cropping with control of the gullies 3. The cereal/leguminous system mixed with olive trees and runoff water harvesting	1. Cereal/leguminous system mixed with olive trees, figs trees; cactus opuntia 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. Improved system based on grazing and	

		cereal cropping with control of the 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. Precision irrigation of forage instead of overhead sprinkler irrigation (which uses excessive amounts of water) 2. Drip irrigation 3. Reducing of the infiltration losses from water supply channels	1. Precision irrigation 2. Drip irrigation 3. Impermeability of irrigation channels 4. Drainage of irrigated agricultural fields 5. Phytoreclamation of soil secondary salinity at agricultural fields	
Russia (Dzhanybek)	1. Grazing land management by rotation introducing 2. Drip irrigation 3. Forest, apple tree plantation or shrub belt planting 4. Contour planting and gully control	1. Drip irrigation 2. Impermeability of the bed of water storage capacities	

Table 4: Factors identified by workshop participants that could enhance the adoption of remediation strategies prioritised in the final DESIRE workshop. For detailed discussion of factors that could enable further uptake, see workshop reports in section 4.

Study Site	Priority Remediation Strategies	Summary of key enablers
Cape Verde	Vegetative barriers/cover	• Target the technology to specific types of land • Secure funding from NGOs and municipality • Build the capacity of farmers and provide technical assistance • Promote adoption of the proposed strategy via specific existing national and international policies • Use drought resistant species in more arid areas or target at irrigated land
Mexico	• Agave forestry sustainable plantations with native plants • Wood saver ovens • Agronomical strategies • Spatially targeted run-off control in gullies	• Establish and maintain long-term working relationships with local and regional stakeholders, including Government Ministries and agencies • Adapt remediation strategies to fit in with ongoing Government initiatives • Spatially target the adoption of remediation strategies that do not work everywhere • Investigate funding and legal aspects of technologies in addition to their technical feasibility • Consider the potential for unintended consequences of promising technologies (e.g. wood burning stoves displacing gas burning stoves and so increasing demand for wood)
Spain	• Green manure in Almonds orchards • Reduced tillage in Cereal and Almond fields • Traditional water harvesting (Boquera) • Organic mulch to reduce water losses	1. Training: a) of technical representatives at farmers organizations , and b) at high-schools and universities to create awareness and put environmental sustainability higher on the agenda. 2. Demonstration activities in the field and development of a network of demonstration and experimental farms throughout the region 3. Better cooperation and collaboration between different institutes (i.e. researchers, administration and farmers organisations) 4. Economic support for implementation of SLM measures 5. Lobby and convince responsible policy makers 6. Put higher economic and social value on products that are produced in a sustainable

		manner 7. Link payment of agricultural subsidies to implementation of effective SLM measures 8. More dissemination and publicity for SLM measures through newsletters and websites
Turkey (Karapinar)	• Fallow with stubble farming • Fallow without stubble farming • Minimum tillage	• Communicate results of field trials and models as widely as possible via brochures and meetings • Articles in newspapers and specialist press
Turkey (Eskişehir)	• Wooden fences with soil bund • Contour tillage	• Communicate likely future challenges relating to ground water availability and wind erosion to raise awareness of the need to adopt more sustainable approaches to land management e.g. through newspapers, brochures and meetings
Chile	No tillage with subsoiling Crop rotation with legumes Agroforestry systems	• Provide economic incentives for the adoption of sustainable practices via Government programmes • Use participatory approaches that take the context and goals of farmers into account, when disseminate results • Facilitate local leadership and long-term coordination between local institutions • Training for technicians to support the adoption of the technologies • Further evaluate the economic and social impact of the soil conservation practices
China	Check dams Reforestation Terraces	• Communicate both environmental and economic benefits as widely as possible • Work with existing schemes where possible
Portugal	Primary Strip Network System for Fuel Management Prescribed Fire	• Reformulate legislation and simplify bureaucracy • Promote association membership and then promote remediation strategies through associations • Provide economic incentives • Create demonstration sites • Raise awareness of the benefits of prescribed fire among rural populations
Tunisia	Flood spreading & recharge units Supplement irrigation Medicinal herbal and aromatic plants	• Consolidate synergies between research programs and development projects • Maintain traditional techniques and local know-how in the management of natural resources while introducing improvements where it is relevant

	Cisterns	• Integrate remediation strategies into regional and national action plans for combating desertification and climate change
Greece (Nestos)	Fresh water transport	• Promote via local agricultural unions and the Regional Department of Water Management • Local press and debates in local coffee shops • Change local water policy (to permit water transport >500 m)
Greece (Crete)	Sustainable grazing	• Change in EU subsidies to incentivise destocking
Morocco	Cereal/leguminous system mixed with olive trees, figs trees; cactus opuntia and runoff water harvesting, in order to improve the production and restore the lands fertility Protection of existing grazing lands, forests and former cultivated areas Improved system based on grazing and cereal cropping with control of the gullies	• Ensure remediation techniques are profitable and have a real effect on farmer incomes • The selected actions must be simple and easy to reproduce, in order to facilitate their adoption by other farmers • Better coordination betwee Government departments working on agriculture and forests • Financial incentives to exclude grazing and plant fodder shrubs, to prevent soil erosion and stabilize gullies
Botswana	Biogas production	• Education, awareness and information dissemination • Demonstration in the context of development projects • Financial assistance • Conservation initiatives (development)
Russia (Novy)	Precision irrigation Drip irrigation Impermeability of irrigation cabals Drainage of irrigated agricultural fields Phytoreclamation of soil secondary salinity at agricultural fields	• Financial incentives • Develop human resources and capacity to use new technologies • Develop relevant technical infrastructure

Russia (Dzhanybek)	Drip irrigation Impermeability of the bed of water storage capacities	Communicate benefits via mass media, including economic and health benefits as well as environmental benefits

4 Workshop Reports

4.1 Cape Verde

4.1.1 Introduction

In Cape Verde, the low soil cover and inadequate practices on rain fed agricultural lands constitute major problems related to desertification. To the fragility of the land associates severe water erosion, causing tons of land to be washed away from the fields every year during the rainy season.

Therefore, the aim in the scope of combating desertification is to provide a certain degree of permanent soil cover to serve as shield for the impact of rain. During the selection workshop several technologies, all related to vegetative cover either as strips or surface cover were discussed. Only two technologies were selected: vegetation strip with pigeon pea and afforestation with fruit trees.

- Technology 1: Pigeon pea (*cajanus cajan*) barriers/strips. It consists in planting seeds of pigeon pea, a leguminous perennial shrub that has dual purpose of protecting the soil and feed people. It is planted in association with maize crop. After the maize is harvested, the soil remains with some degree of cover. Though the objective was to plant as strip barriers, six meters apart, most farmers planted it as surface cover.

- Technology 2: Afforestation with fruit trees. It consists in the plantation of different fruit tree species in humid areas to provide both soil cover and feed for farmers. Since fruit trees require several years to provide effective cover, and though it was implemented in some areas, it was not evaluated during the project's period.

4.1.2 Priority Remediation Strategies

As mentioned, the priority strategy for effective and sustainable combat of desertification was to strengthen vegetative cover on rainfed lands.

Figure 4.1.1: Rainfed land treated with pigeon pea combined

Figure 4.1.2: Steep slope treated with pigeon pea with terraces

The Pigeon pea technology was selected as it appears to be the simplest, most accessible, least expensive, socio economically acceptable technique, with great impact on soil cover and land rehabilitation. Participants, farmers in particular, were unanimous in that pigeon pea is a technology that should be spread in the country because of its numerous advantages (Figures 4.1.1 and 4.1.2).

The same technologies selected during previous workshop were implemented. However, only the pigeon pea technology was evaluated. During evaluation workshop, additional criteria were proposed for the social component to evaluate the technology. These were: employment generation, law enforcement regarding animals invading agricultural fields, urban planning, articulation among institutions and on-going projects related to desertification and food security and quality.

4.1.3 How can we enable priority remediation options to be adopted?

Participants of the workshop, that included several groups of stakeholders, from land users to decision makers, agreed that dissemination of the technology will only be effective if: all groups are involved; each has a well defined task; and it is defined where, when and how it will be done (Table 4.1.1).

Where

It was recommended that the technology should be promoted in:

- ✓ Rainfed lands vulnerable to soil erosion and desertification,
- ✓ Watersheds that will benefit from future dams, particularly on the upstream areas
- ✓ Rainfed lands that need crop diversification

Table 4.1.1: Who, How, When: Effective stakeholders' responsibility

Stakeholder groups	Responsibility	When
Land users	Implementation, maintenance and conservation of technologies Participation in capacity building, participatory research and monitoring	Rainy season 2012 2011-2012
NGOs	Funding (acquisition of seeds, training, ..) Empowerment of local communities (capacity building, follow-	2012 2011-2012

	up)	
Municipality	Funding (acquisition of seeds, training) Planning, monitoring, facilitation/articulation	2012 2011-2012
INIDA	Research, technical assistance Monitoring and dissemination	2011-2012 2011
DGASP/Delegations MDR	Capacity building of farmers, technical assistance Funding, monitoring, legislation	2012
Focal Point of CCD	Information of projects/ programs on the combat of desertification Information on existing global mechanisms for funding	2011

- The local/regional policies that could promote wide adoption of the strategy may include: the National Plan to Combat Desertification (PAN_LCD) _UNCCD, the Municipal Action Plan to Combat Desertification, the Municipal Development Plan (PDM), and the National Action Plan for Environment (PANA)
- Major obstacles to adopt mitigation priority identified in the discussion were:
    - Inapplicability of the technology to arid climatic regions, with very low precipitation. To overcome this obstacle, lands should be treated with a more drought resistant species, such as *Aloe vera*.
    - In arid regions, only irrigated lands can benefit from this technology.
    - Poverty of some families forcing them to consume part of the distributed seeds as food rather than sowing. Solution to this vulnerability is more complex.

4.1.4 Feedback from participants

Participants evaluated the workshop as positive and rated it good to very good since it provided them an opportunity to know the results of the project that they were part of, and participated in actively.

Regarding the project, participants found the participatory approach and methodology used in its implementation very good. This was because it gave each group of stakeholder the opportunity to be part of the project and share responsibility for the success of the selected technology.

It was registered the reactions of some participants and here are some quotes from them:

Farmers:

- "I recommend all my friends to plant pigeon pea in their land"
- " Pigeon pea helps woman to feed their children, get extra income, enrich the soil and protect their land from being carried away"

Technicians:

- "The DESIRE methodology enforced the participatory approach used in Cape Verde to combat desertification"
- "The project changed the attitude of land users regarding the use of Natural Resources"

UNCCD focal point:

- "The objectives of the DESIRE project fit in the goals of UNCCD and the positive results should be applied to other watersheds in Cape Verde"

4.1.5 Next steps

Some of the actions to be taken for widespread of technology are:

- Field survey of potential areas to apply the technology
- Identification of funding sources
- Capacity building/sensitization of land users
- Implementation
- Monitoring
- Wide scale dissemination

Other agreed actions:

- To carry out farmers exchange visits to pigeon pea plots and have the farmers hosting the event. Farmers are most likely to adopt technologies from their fellow farmers than from technical services
- Regarding dates and responsibilities, the previous table specifies which stakeholder group is responsible for each task in the dissemination process, and gives dates for completion.

4.2 Mexico

4.2.1 Introduction

The Cointzio basin is important as a catchment supplying drinking water to the regional capital, Morelia. Land degradation (principally soil erosion) and flooding result from its unique combination of land uses (some mechanized farming, mainly rainfed agriculture with free grazing cattle, forest, recent avocado plantations), climate (temperate semi-humid with a 6 month rainy season), and soils and geomorphology (Luvisol on plain, Acrisol on piedmont, Cambisol andico and Andisol upper part) (Figure 4.2.1).

The DESIRE project in this study site has helped understand the origin and processes of soil erosion, and test different alternatives to reduce it. The approach taken tackles both the effects of land degradation (e.g. gullies) and the causes of the soil erosion (rain agressivity, combined with soil properties and cattle grazing). Two main trials have taken place at two different scales:

- Plot scale trials with farmers to test agronomic options (2004-2008); and
- Watershed scale testing and evaluation of land use management (2007-2011)

These tests are organised according to the soil type (Andosol–Cambisol, Acrisol), land use (agriculture, forestry, pasture) and focused on small farmers, with low to moderate mechanization, with usually no irrigation, low incomes and low school level.

Figure 4.2.1: Soil erosion in Cointzio watershed : a) Basin of El Calabozo-Potrerillos ; and b) Huertitas bassin (Photos : C. Prat, IRD)

4.2.2 Priority Remediation Strategies

Three remediation technologies were defined and discussed during the first workshop (WB3) with stakeholders. During field trials, a new technology was proposed (agave forestry) and so was included for evaluation in the final workshop. Table 4.2.1 shows how technologies were ranked in the initial (WB3) workshop, compared to the rank after field trials and model results were presented at the final workshop (ranks are in declining order of importance).

Table 4.2.1: Remediation strategies ranked by participants in WB3 workshop versus final workshop.

Initial rank	End rank	Remediation Strategy
-	1	Agave forestry sustainable plantations with native plants (agave, tree, annual herbaceous)
1	2	Agronomical strategies (let fallow using cereals during this year and corn the other one, incorporation of harvest residues to cover at least a 1/3 part of the field)
2	1	Wood saver rural oven
3	3	Control run-off on existing gullies

4.2.3 How can we enable priority remediation options to be adopted?

The DESIRE project has worked with local institutions from the outset (and project members had existing long-standing relationships with these institutions). For this reason, the DESIRE project became part of a series of workshops run by SEMARNAT-CONAGUA with stakeholders of the Cuitzeo watershed. The objective was to identify problems, propose solutions and define the conditions (money, responsibilities, time-lines) to ensure proposed solutions would be effective. The document "Integral management plan of natural resources of Cuitzeo watershed" resulting from this workshop was signed by the Michoacan state governor at the beginning of 2009. Within this document, the management plan for the Lerma-Chapala catchment (where Cuitzeo and so, Cointzio, is located) included a number of recommendations arising from research undertaken as part of the DESIRE project. Although this process took some time, the result is clear: there are no major obstacles for adopting the priority remediation options locally or regionally, and a number are already being promoted by regional Government and being adopted by local stakeholders. The following sub-sections summarise more detailed comments from workshop participants about challenges and opportunities for promoting each of the proposed remediation strategies.

<u>Technology 1: Agricultural practices</u>

Despite considerable interest during workshops, few farmers were using the proposed agronomical practices. The main reason is not due to a lack of confidence of the results (farmers could visit the practices for instance) or a lack of money to implement this techniques (SEMARNAT funds are used for this); it is mainly a lack of time to implement the practices. Between 10-20% of annual farmer incomes come from the sale of agricultural products; the rest is typically derived off-farm. As such, the additional time needed to implement new agronomic practices can be associated with significant opportunity costs for the generation of off-farm income.

Figure 4.2.2a: Plots on Acrisol (Photo : C. Prat, IRD)

Figure 4.2.2a: Plots on Andosol (Photo : C. Prat, IRD)

Technology 2: Gully control

Although farmers want to control the formation of gullies on their land, and stone dams were initially suggested, workshop participants were sceptical about the efficiency of this technique. This scepticism was backed up by results from field trials that confirmed most dams were not very effective. After discussion during the workshop, participants concluded that stone dams were only likely to be effective in certain locations and that topographic surveys should be carried out prior to siting future dams.

Figure 4.2.3: Gully control in El Calabozo-Potrerillos bassin (Photo : C. Prat, IRD)

Technology 3: Agaveforestry

Agave forestry was proposed after the first workshop, and so does not appear in the first ranking. This proposal took time to propose because it was first necessary to consider other experiences with the technology, evaluate their results and difficulties, improve and adapt the technology to the local context, find funds, and ensure the production and sale of spirits derived from the plant would be legal (for marketing purposes, it was essential to obtain the “mescal” denomination, reserved for specific regions of Mexico).

Workshop participants deemed this to be a particularly innovative and effective technology. The team planted a number of agaves on 5 ha in 2010 to see how the plants would grow, and what work, costs and time would be required to make the technology work successfully. After one year, more than 90% of the plants were still alive and growing well. Stakeholders attending the final workshop were positive about this technology and already organized to find good planting stock, treat the seeds, to find and arrange space for the building of greenhouses etc.

Figure 4.2.4: Plantation of agave in El Calabozo-Potrerillos bassin and what it should be in 7 years for the best (Photo : C. Prat, IRD)

Technology 4: Wood saver rural oven

The wood saver oven was initially proposed by the Mexican Government's Secretariat of the Environment and Natural Resources (SEMARNAT). Deforestation is one of the main drivers of environmental degradation in the region, and workshop participants felt that the use of the wood saver oven was an excellent way of reducing this problem. In addition, SEMARNAT provides the materials and technical help to build the ovens, so costs for local stakeholders are extremely low. So, despite sluggish initial demand, after one year, the demand exploded. It is very easy from one family to see the oven working for a neighbouring family, and share experiences with one another. Given the almost unanimous positive feedback about stoves, demand grew rapidly during the field trial period. It should however be noted that although the use of ovens has the potential to reduce wood consumption by between 30-50%, where wood burners replace gas burners, the popularity of the wood stoves may be counter-productive, and workshop participants pointed out that adoption of the wood burning stove by gas burning families could cancel out the reduction in demand for wood. Hence, it was suggested by participants that there may be a need to plant fast growing plantation forestry to meet future demand for wood. As such, workshop findings need to be analysed in future with reference to data on the quantity of wood consumed by a communities using the stoves.

Figure 4.2.5: Wood saver rural oven (« patsari » model) (Photo: E. Rios, SEMARNAT)

4.2.4 Feedback from participants

All workshop participants were very positive about the DESIRE project and methodology used, especially with the workshops. For land users, workshops helped them to identify and connect with the institutions and the people who are working with them. For them, it was also a good place to get news, make balance of some actions, and prepare the future. As workshops were open to anyone, the workshops helped to give more transparency to the actions and decisions that arose from the process. Participants particularly liked the different “games” that were used to animate the workshops, as these kept their interest and helped them to identify problems, solutions and their own priorities.

The only real problem was the difficulty of including some other institutions other than those that typically attended workshops as part of the DESIRE process. Although the project team interacted with these other organisations, it would have been better to have them present more often during the land-user workshops.

The results of the DESIRE project have been important for a number of programs and actions linked to SEMARNAT, and for the people living in the Cointzio watershed. A number of proposals have already been accepted, while others are still under development.

Figure 4.2.6: Workshops for the elaboration of the management plan of Cuitzeo lake catchment (Photos C. Prat, IRD) in 2008

Figure 4.2.7: The last workshop, august 2011 in San Andres Coapa (photos E. Rios, SEMARNAT; C. Prat, IRD)

4.2.5 Next steps

The following actions have been agreed:

- SEMARNAT has agreed to fund the development of agave forestry with local stakeholders as well as the monitoring of test areas for the next few years. It is hoped that in a few years, people earning enough money with the agaveforestry, will reduce the number of the cattle and will control their grazing area in a better way than they presently do. The other consequence may be that children will remain on the land, rather than migrating to the city, and will be interested in improving the sustainability of land management, following recommendations from the DESIRE project
- SEMARNAT will spatially target the construction of stone dams to control gullies in future, in collaboration with the DESIRE team and others institutions (e.g. municipalities, CONAFOR etc.)
- In response to DESIRE research findings, the National Water Commission, CONAGUA, used the Cointzio watershed as a pilot basin to test a new way of using hydrological water taxes for forest protection
- The DESIRE methodology will continued to be followed in future years (workshops, involvement with authorities, stakeholders, etc…), making an effort to continue coordinating between different parts of the Government administration and trying to get more than those who are already coming, during the land-user workshops
- Dissemination of results to the stakeholders, especially through the commission and the technical committee of Cuitzeo catchment will follow
- August 2012: Forum of Cuitzeo watershed (where Cointzio is located) with national, regional and local authorities, scientifics, administrations, stakeholders, people. Objective: to design and implement special land and water management programs for the Cuitzeo watershed, with a focus on the Cointzio basin
- May 2013: National Watershed Management Congress (scientific meeting) - one session will be dedicated to research and results obtained in the Cuitzeo/Cointzio basin, including those from the DESIRE project

4.3 Spain

4.3.1 Introduction

The Guadalentín study site suffers from severe land degradation problems caused by diverse processes such as soil erosion by water and tillage, salinization, overexploitation and contamination of aquifers, and forest fires. These processes are favoured by a combination of the Mediterranean climate, characterised by dry summers followed by intense autumn rainfall, an often steep topography with fragile soils on highly erodible lithologies. Moreover, initiated by political and socioeconomic changes, important land use changes have taken place over the last centuries, which have formed an important driver for further land degradation.

Land degradation processes in the Guadalentín have a range of local and regional impacts on crop productivity, reduced soil organic carbon content, loss of soil structure, water shortage and sedimentation of reservoirs. The main objective of Sustainable Land Management (SLM) measures in the Guadalentín as identified by DESIRE workshop participants is therefore to reduce soil and water loss and increase soil fertility.

Figure 4.3.1: Example of degraded land in the Guadalentín (photo: J. de Vente)

To fulfil this objective, during the first two DESIRE workshops in 2008, five SLM measures were selected to be implemented and tested in the field of the Alhagüeces farm. The following SLM strategies were selected by participants because they were conceived to be easy to implement, economically feasible and effective towards protection of soil and water resources:

- ***Green manure in an ecological almond orchard***: In this technology, green manure, a mixture of barley and vetch (*Vicia sativa*) was seeded under almond trees in autumn and ploughed into the soil in spring. The green manure provides a continuous vegetation cover throughout the winter

protecting the soil from soil erosion. Besides, the vetch is a nitrogen fixating species and has a fertilizer effect on the soil.

- ***Reduced tillage of an almond orchard***: In this technology, an almond orchard is ploughed only twice a year (spring and autumn) instead of the 3-5 times that are common in the region.

- ***Traditional water harvesting (boquera)***: This SLM measure aims to increase the available water for crops by diverting water during rainfall events from a nearby ephemeral stream (rambla) towards nearly flat terraces.

- ***Straw mulch under almonds***: In this measure a straw mulch cover under almond canopy is applied to reduce evaporation losses from the soil.

- ***Reduced tillage of a cereal field***: Here, a cereal field was ploughed maximum of 3 times in 2 years with a chisel plough. This is much less than under traditional tillage where fields are ploughed five times in two years of which once with a mouldboard plough.

This report presents a brief summary of the fourth DESIRE stakeholder workshop on SLM measures in the Guadalentín drainage basin, held the 28 of September 2011 in the village of Totana. This workshop is the direct continuation of three previous workshops which were described in previous reports (see www.desire-project.eu).

4.3.2 Priority remediation strategies

After presentation and discussion of monitoring results, the participants were asked to rank each of the five SLM measures according to the twelve evaluation criteria that were selected and used in previous workshops (Figure 4.3.2). Therefore, the participants were divided in three groups; farmers, administration + NGO's, and scientists. Each group made its own ranking per SLM for each criterion. By combining the scores for all criteria using a multi-criteria approach, an overall ranking of the monitored SLM was obtained per group. Ranks were compared between groups and an overall ranking was obtained by taking the average ranking of the three groups (Table 4.3.1). Although there were some small differences, all three groups very much agreed over the ranking.

Figure 4.3.2: Participants ranking SLM according to 12 evaluation criteria

Table 4.3.1 illustrates that the experimental results from DESIRE had an important effect on the stakeholders opinion about some of the measures as the ranking that was made before monitoring during the second workshop deviates from the ranking after monitoring. It must be emphasised however that stakeholders prefer a package of options rather than just 1 or 2 SLM measures. Not all measures can be used in all settings and therefore, a combination of these four options is suggested as best strategy towards SLM.

Table 4.3.1: Ranking of remediation options before and after field trials

Rank	Before field trials (workshop 2)	After field trials (workshop 4)
1	Traditional water harvesting (Boquera)	Green manure in Almonds orchards
2	Reduced tillage in Cereal and Almond fields	Reduced tillage in Cereal and Almond fields
3	Organic mulch to reduce water losses	Traditional water harvesting (Boquera)
4	Green manure in Almonds orchards	Organic mulch to reduce water losses

The main reasons for the ranking as commented by participants comes from the fact that the highest ranked options are effective (they reduce soil and water loss and increase or maintain farm income) and relatively simple and economically feasible to implement. Participants were also very positive about traditional water harvesting, but ranked it somewhat lower because it requires some initial costs, it cannot be applied in all fields, and it may have undesired effects downstream like reducing water availability to other fields. Most participants were not enthusiastic about straw mulch to reduce evaporation losses because the field trials demonstrated that this measure is relatively expensive and did not increase the soils water content. It was stressed that other types of mulch may

be effective and therefore this issue needs further research before the measure can be recommended for wider implementation.

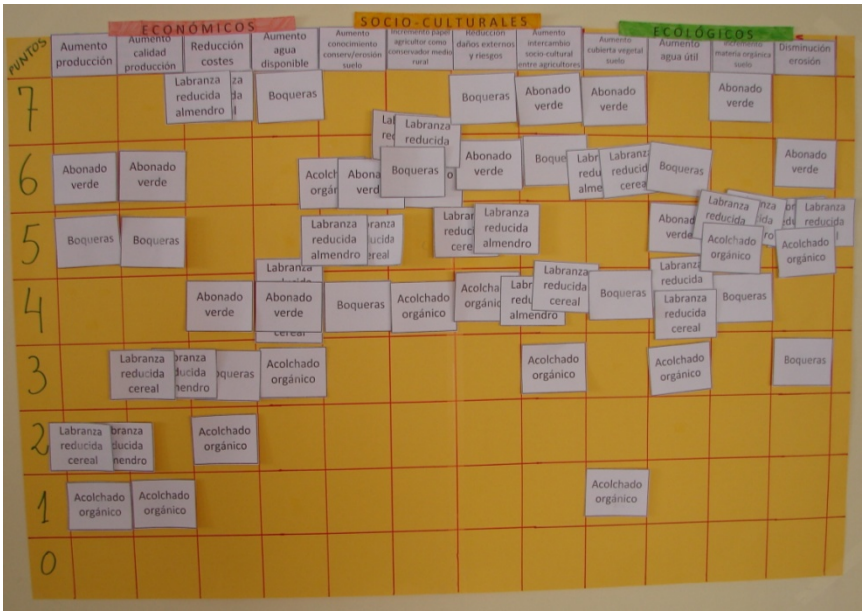


Figure 4.3.3: Example of a table used for ranking of SLM measures

4.3.3 How can we enable priority remediation options to be adopted?

In an extensive discussion and brainstorm session a long list of suggestions was made of recommended actions to enable adoption of priority SLM measures. These ideas were then classified in groups of similar ideas and participants voted for the groups or individual actions they most liked and expected to be most effective and realistic to have an impact (Figure 4.3.4).

Figure 4.3.4: Participants voting for actions to disseminate SLM measures and promote their wider adoption

The main groups of ideas about how selected SLM strategies can be best disseminated for uptake by land managers and policy-makers is given in the ranked list below:

1. **Training**: a) of technical representatives at farmers organizations , and b) at high-schools and universities to create awareness and put environmental sustainability higher on the agenda.
2. **Demonstration activities** in the field and development of a network of demonstration and experimental farms throughout the region
3. **Better cooperation and collaboration** between different institutes (i.e. researchers, administration and farmers organisations)
4. **Economic support** for implementation of SLM measures
5. **Lobby** and convince responsible policy makers
6. **Put higher economic and social value** on products that are produced in a sustainable manner
7. **Link payment of agricultural subsidies to implementation** of effective SLM measures
8. **More dissemination and publicity** for SLM measures through newsletters and websites

Part of these actions may very well be linked to the Rural Development Programmes. Currently, the first steps are made to develop the next RDP in which subsidies for soil and water conservation measures and good practice for agriculture will be described. A priority action is therefore to feed the DESIRE workshop results into this process. Furthermore, existing training activities from the regional ministries towards farmers and technicians of farmers' organisations may also benefit from these results.

Participants agree on the fact that the main obstacles for adopting the priority solutions are related to awareness, knowledge and a fear amongst farmers for economic costs related to any change in land management activities. Moreover, many farmers feel that anything they do to protect natural resources is not really valued by wider society. To overcome these challenges, there is therefore a high need for training and awareness building at various levels as reflected in the first action line.

Most participants indicated that optimal dissemination is achieved through field demonstration to farmers and technicians of farmers' organisations. Websites and folders are far less effective ways of communication. Further changes at a larger scale and with possible economic support can only be achieved through lobbying responsible policy makers.

4.3.4 Feedback from participants

Generally, participants valued the workshop and their experience in DESIRE very positively. Participants indicated they learned a lot from each other, from discussions and from the results of field trials. The interactive approach of workshops was considered effective to achieve interaction between participants, and was highly valued. However, all participants agreed that a higher participation of farmers is required and that to achieve this, a different approach may be needed

with meetings outside in the field and only for maximum half a day. See Table 4.3.2 for detailed answers to evaluation questions.

Table 4.3.2: Detailed answers to evaluation questions by workshop participants in Spain (where relevant, the number of responses is indicated in square brackets)

Evaluation Questions:
1. What benefit did you have of participating in this workshop? (more than 1 option possible) [7] Learn from farmers [6] Learn from scientists [12] Learn from other participants [7] Learn about the results of field trials [5] Make new contacts [7] Better understand the land degradation problem [6] Better understand the solutions to and degradation [ ] Others: - *You see simple and feasible solutions* - *Learn from participatory projects* - *Tolerance between the different sectors (stakeholders)*
2. Did the monitoring results change your opinion over the evaluated SLM measures? ***Yes, because*** - *Very tangible results were provided over solutions that are innovative* - *Good results were obtained* - *I was especially surprised by the result of mulching* - *I was not aware of the implications of each measure* - *Some measures gave surprising results, some performed as expected others did not* - *I was not yet aware of some of the ecological and economic impacts of some measures like green manure* - *You learn and value other measures* - *I learned that the mulch type as applied in this project did not give the expected results* - *Some measures were not as effective as we expected* ***No, because*:** - *I think I already expected these results* - *I agree with the results* - *The results are similar to what I expected*
3. How do you value the interactive approach of this workshop? ***Good, because*:** - *it is the best way to include all sectors, empathizing with others and getting better understanding of the other peoples opinion* - *Active participation was facilitated (3X)* - *It facilitates participants to express their opinion* - *Very enriching, mutual learning* - *It combines the opinion of scientists and farmers* - *I think this is the best available method to facilitate the active participation between scientists and administration*

- *It promotes participation, collaboration and helps to better understand*
- *It aims to integrate different stakeholder groups (farmers, administration, scientists)*
- *Exchange of experiences and generates ideas*
- *Everyone participated, it's very dynamic*

Regular,because: *[no responses]*

Poor, because**:** *[no responses]*

4. In your opinion, what is the best way to promote and disseminate the main messages that have come out of this workshop to a wider audience?

[ ] Newsletters and folders for farmers
[9] Field demonstrations
[11] Presentation and demonstration to farmers organisations
[8] Provide information to responsible politicians
[1] Provide a website with information
[ ] Others:
- A regional network of experimental farms for demonstration
- Local radio and television
- Informative meetings (trainings) of short duration (a few hours) for farmers and technicians of farmers organisations

5. Please, indicate in one line what you liked most and what you liked least of participating in the DESIRE workshops:

Most:

- *It was very interesting with a good communication of results*
- *Participation of all people present*
- *Participation of various agricultural sectors*
- *The possibility to start a debate over different subjects and that al opinions are valid independent of from who it originates*
- *Hear the opinion of various stakeholder groups and experience in participation*
- *The effectiveness of the tools that were used in the workshops*
- *The results of the experiments and the dynamical process of participation*
- *Multidisciplinary workshop*
- *Interaction between different stakeholder groups*
- *The results and experiences of technicians*
- *Very dynamic process*

Least:

- *More participation of farmers is needed (5x), which requires new strategies for participation*
- *The length of discourse of some of the participants that made us drift away from the main theme.*
- *The practical dissemination of results*
- *More participation of general public (people who do not work in the field) is needed*
- *Little time*
- *Too much information to deal with*

4.3.5 Next steps

The following actions are agreed upon for the coming months:

- Send Newsletter 3 with monitoring results to stakeholders after the workshop
- Send Workshop report to participants early November
- Representatives from CSIC will make an appointment with the DG of the regional ministry of Agriculture and of Environment to present and discuss DESIRE and workshop results
- Researchers will contact relevant programmes at universities to disseminate DESIRE results and ask more attention for sustainable development and possibilities for SLM in agriculture
- Organise field demonstration day when more results are available

Although the DESIRE project will finish early 2012, the field trials at the experimental farm 'Los Alhagüeces' will continue as part of a new research project funded by the Spanish Ministry of Science and Innovation. Therefore, the DESIRE research team compromise to do all possible to keep stakeholders informed and continue organizing meetings with those who are interested in order to continue improving and disseminating optimal SLM measures that help us maintaining or improving productivity and protecting our natural resources.

4.4 Turkey: Eskişehir

4.4.1 Introduction

Since the Eskişehir study site is situated in the mountainous northern part of the Eskisehir region, where hill slope gradients and precipitation are relatively high compared to elsewhere, the main goal of remediation here is to decrease water erosion. Due to the long-standing nature of this problem, together with a lack of any previous initiatives to prevent soil erosion, soil profiles are thin, stoniness is high and soil organic matter content is low. Dry-farming fields in the vicinity exhibit severe rill erosion (Figure 4.4.1) which has been facilitated by agricultural practices such as ploughing abnormally deep or with the slope of the land.

The field where remediation strategies were tested was divided into three parts: i) a control plot where no remediation technologies were applied (i.e. down-slope ploughing continued); ii) contour ploughing; and iii) contour ploughing with terracing.

Terracing (also called fencing) consists of wooden stakes of 150 cm high inserted into ground and woven by tiny branches in between. Part of the soil from the upslope of the fence was piled up to support stakes and prevent run-off over the fence. Contour ploughing (including tillage) was applied in the western parcel of about 50 m long. Contours here were NE-running.

Figure 4.4.1: Rill erosion in vicinity of the trial field, N. Eskişehir.

4.4.2 Priority Remediation Strategies

The previous WB3 workshops prioritised four technologies to prevent water erosion in dry farming areas in Eskişehir (Table 4.4.1). After discussion with stakeholders, some of these technologies were slightly adapted in light of local conditions and future development. Instead of planted soil bunds, wooden fences with similar advantages were tested. Contour tillage, spoken about, but not voted on during the WB3 meeting, was also tested. These two technologies were applied and monitored for two years and the results were evaluated in a final stakeholder workshop, held in June 2011 in Eskişehir.

The outcomes and disadvantages observed for each technology were explained to farmers on the basis of evidence from field trials and models. After refreshing the memories of participants with a summary of the criteria used previously to evaluate remediation strategies, participants were invited to suggest new criteria set to assess the relevance of remediation technologies for their future practice. They selected the same criteria set as used in the WB3 meeting, and used these to prioritise the technologies that had been tested in the field. As a result, wooden fences were ranked most high, followed by contour tillage (Table 4.4.1). Stakeholders prioritised wooden terraces mostly due to their economic advantages (Figure 4.3.2). They thought that this strategy was most likely to increase crop yield and decrease risks to production, though it has a significant installation cost. Generally speaking, the terracing technology was considered superior in relation to socio-cultural and ecological criteria. Contour tillage is still a relevant option to participants, with a very low installation cost, and relatively good crop yields and conservation characteristics. However, participants expressed doubts about how effectively this technology would work during extreme rainfall events.

Table 4.4.1: Ranking of remediation options before and after field trials and modelling

Rank	Pre-results (WB3)	Post-results from trials and models
1	Planted soil bunds	Wooden fences with soil bund
2	Stone bunds	Contour tillage
3	Fanya juu terraces	

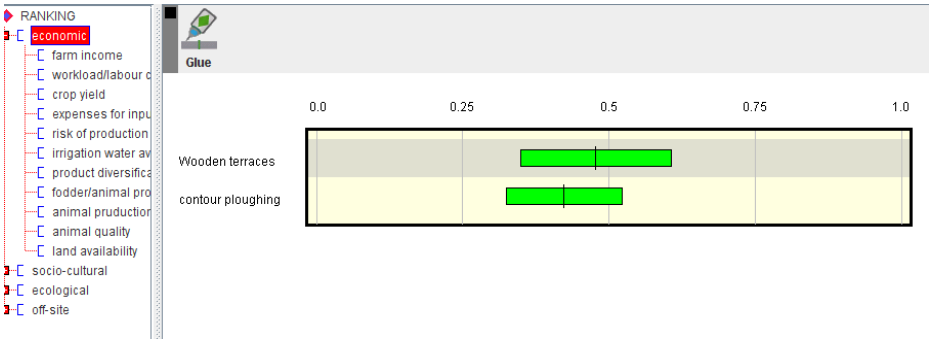


Figure 4.4.2: Ranking results and the criteria used to assess remediation technologies from the economic viewpoint

4.4.3 How can we enable priority remediation options to be adopted?

Stakeholders thought that the results of monitoring activities would be of central significance in facilitating the adoption of remediation strategies by farmers (Figure 4.4.3). They thought it was

important to simply explain the likely yield increase and types of expenditure associated with each technology in well designed brochures and in meetings/conferences with stakeholders.

Carefully designed popular articles to be seen in local newspapers were considered equally useful. More detailed policy briefs were thought suitable for policy makers at various levels. The main obstacle to adoption was perceived to be economic and demographic constraints e.g. decreasing welfare and emptying of rural settlements due to migration.

Figure 4.4.3: Stakeholders are discussing the remediation options at WB4-5 workshop.

4.4.4 Feedback from participants

All participants agreed that the inclusive nature of the DESIRE project was particularly useful, although it was time-consuming. Farmers especially welcomed the team's approach to determining future steps through discussion with them. More funding and involvement of farmers during the experimental phase of the project would increase the probability that remediation strategies were adopted more widely. The project team felt that the farmers "excessively credit the results of experiments, so they could not dare to express their contradictions".

4.4.5 Next steps

The following next steps were agreed at the workshop:

- Project management and scientific staffs promised to prepare and send this workshop report in October 2011 (it was done in time)
- A brochure including the virtues of wooden terraces will be prepared and disseminated by Dr. İnci Tolay and Dr. Zehra Altaç during November 2011
- A newspaper article on the remediation strategies will be prepared by Dr. Faruk Ocakoğlu in September 2011

4.5 Turkey: Karapınar

4.5.1 Introduction

The Karapınar area is the most arid part of Anatolia, and suffers significantly from wind erosion due to unfavorable soil texture and meteorological conditions, combined with intensive use of ground water resources. An experimental design was set up in a strip farming area to test the effect of wind erosion on wheat crop (Ekiz bread wheat) (Figure 4.5.1). Technologies applied in this study site were minimum tillage, ploughed stubble fallowing and stubble fallowing. Area of each technologies was further divided into four parcels, and two of them were sowed that year with a fallow parcel in between.

Figure 4.5.1: View of the applications of technologies in strip farming plan, Karapınar hotspot.

4.5.2 Priority Remediation Strategies

In the previous WB3 workshops, minimum tillage technology was prioritized for testing, using mostly vegetative indicators for two years to understand the changing topsoil quality and water demand. Project staff added stubble farming technology and replaced the no-till technology with minimum tillage for testing. After two years monitoring, a stakeholder workshop was held in June 2011 in Karapınar to evaluate research findings with local land users.

After presenting monitoring and modelling results and reminding participants of the criteria used to evaluate remediation technologies during the previous WB3 workshop, participants selected the same criteria set again to assess the significance of remediation technologies that had been tested and modeled. Prioritisation of remediation strategies indicated that fallow with stubble farming was deemed slightly more advantageous than other strategies, due to its effect on increasing yield, and probably encouraging soil and water conservation (Table 4.5.1). Ecological parameters were prioritized in a similar way (Figure 4.5.2). Stakeholders feared particularly that fallowed areas

significantly reduced farm incomes. Minimum tillage unexpectedly gave low yields and scored poorly in relation to other secondary vegetative indicators, and hence was de-prioritised by stakeholders.

Table 4.5.1: Ranking of remediation options before and after field trials and modelling in Karapinar

Rank	Pre-results (WB3)	Post-results from trials and models
1	No-till technology	Fallow with stubble farming
2	Pressurized irrigation	Fallow without stubble farming
3	Drought-resistant crop production	Minimum tillage

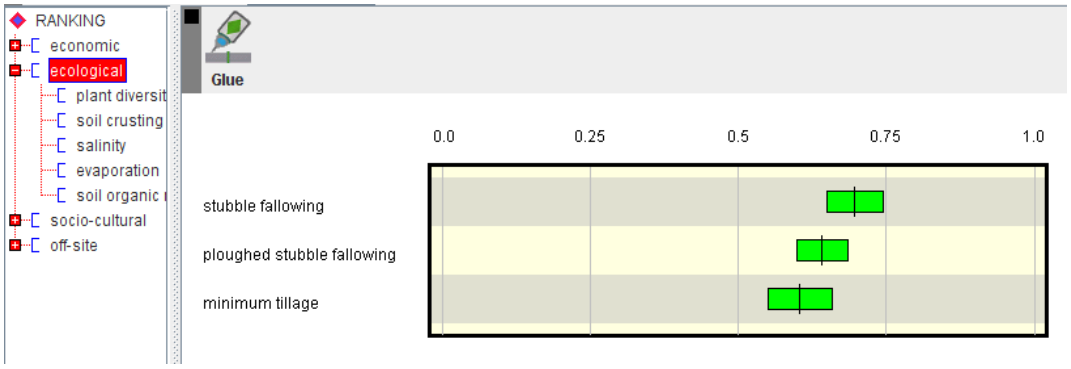


Figure 4.5.2: Ranking results of the three technologies applied according to ecological criteria in Karapınar

4.5.3 How can we enable priority remediation options to be adopted?

Stakeholders considered that though stubble and ploughed stubble farming caused slight advantages, they required considerable areas of fallowed strips that would diminish the widespread adoption of the technology due to income forgone from fallow land. It was suggested that these technologies would be likely to become better alternatives when ground water resources became scarcer and more expensive in (the near) future.

Informative brochures with information about likely increases in yields and information about likely income and expenses associated with each technology were thought to be a good way to increase adoption. Participants suggested that such a brochure should include trends in ground water availability and data on increases in wind erosion, explaining how these may become increasing problems in the near future, necessitating the adoption of the proposed remediation strategies. The main obstacle to the adoption of the proposed strategies was the relatively minor decrease in income due to incorporating fallowed strips into fields.

Figure 4.5.3: Stakeholders are discussing the remediation options at WB4-5 workshop.

4.5.4 Feedback from participants

All participants were positive about the inclusive nature of DESIRE project, although it was time-consuming. Heavy field works (irrigation etc.) prevented farmers from attending some of the planned meetings. More funding and involvement of farmers in the experimental phase of project would increase the probability of widespread adoption of remediation strategies.

4.5.5 Next steps

The following actions were agreed:

- Workshop report will be sent to stakeholders between 15-30 October, 2011 (it was done in time)
- A brochure including the advantages of stubble farming will be prepared and disseminated by Dr. Mehmet Zengin during November 2011

4.6 Chile

4.6.1 Introduction

Mediterranean dryland areas of central Chile have been subjected for more than four centuries to significant degradation of their natural resources. Most of this two million hectare area is occupied by a traditional agricultural system that combines livestock activities with the production of cereals, in soils with high slope. As a result of the prevailing land use systems, about two thirds of "secano interior" soils are badly eroded (IREN, 2010), and soil organic matter and fertility are very low in many places. At the macro regional level, erosion has created a range of environmental problems, such as silitation of rivers and ports, and serious problems with flooding in both rural and urban areas. The parts of the country that face these environmental challenges are often the areas of the country with the greatest concentration of rural poverty and social inequity.

Figure 4.6.1: Land degradation problems in the Chilean study site

Description of the remediation strategies that were tested in WB4:

- Technology 1: no-tillage with subsoiling. No tillage preceded by subsoiling consists of the use of a subsoiler at a 50 cm depth every 5 years before performing no tillage agriculture. This technology permitted to mitigate water erosion compared to the traditional tillage.

Figure 4.6.2: Zero tillage machine tractioned by oxen. Seeding of lentils in the rainfed area of Ninhue County (Photo by Carlos Ruiz)

- Technology 2: crop rotation with legumes. These systems combine phases of legumes of different lengths, in which N is fixed and accumulated in the soil, followed by phases of cereals where accumulated N is extracted. In this new rotation four legume-wheat rotations were compared to a monoculture crop rotation (wheat followed by oat). The legume species are: narrow-leaf lupin (*Lupinus angustifolium*); yellow lupin (*Lupinus luteus*); Peas (*Pisum sativum*); and a fodder mixture of vetch (*Vicia atropurpurea*) + oat.

Figure 4.6.3: Crop rotations experiments in the "secano interior" of Cauquenes (Photo: Soledad Espinoza)

- Technology 3: agroforestry systems. Under Mediterranean climate, water availability for woody species, especially in the first summer, is a key factor in the survival, growth and successful establishment of tree species. The use of conservationist systems of soil and water management allows a more favorable water balance, increasing water infiltration into the soil and their availability for the development of agroforestry species. Agroforestry species used were cork oak (*Quercus suber*), Quillaja (*Quillaja saponaria*) and a fodder tree call tagasaste (*Chamaecytisys proliferus*). This species showed the highest growth in height, crown diameter and trunk diameter. Among conservation structures, infiltration trenches favor the development of species, but are expensive and less efficient in retaining water in the profile, compared to subsoiling with ridge. This structure has shown an increase in moisture content over the infiltration trench between 0-70 cm deep.

Figure 4.6.4: System of multipurpose planting trees planting on infiltration trenches (left); and a system of multipurpose tree planting on a subsoil tillage ridge (right)

4.6.2 Priority Remediation Strategies

Priority remediation technologies selected in the final workshop are shown in Table 4.6.1. Table 4.6.2 indicates the scale at which each criterion was evaluated and Table 4.6.3 shows the grades given to each criterion for each technology. The strategies were chosen based on the economic, environmental and social benefits that different technologies could offer. A very important set of criteria was all about economics, productivity, profitability and market access. Also, farmers and technicians who participated in the workshop have very well evaluated the subgroup of environmental criteria. So they chose primarily those technologies more profitable and more efficient in terms of control of erosion and mitigate land degradation.

Table 4.6.1: Ranking of remediation options before and after field trials and modelling in Chile

Rank	Technologies ranked in WB3 workshop	Technologies ranked in WB4-5 workshop
1	No tillage with subsoiling	No tillage with subsoiling
2	Agroforestry systems	Crop rotation with legumes
3	Crop rotation with legumes	Agroforestry systems

Table 4.6.2: Rating scale technologies

High negative impact	Slight negative impact	Neutral	Slight positive impact	High negative impact
-2	-1	0	+1	+2

Table 4.6.3: Grades allocated to every technology according to the assessment criterion

Relevance Criterion	0 lab + subsolado	Agroforestal	Rot. Cultivo - leguminosa
Yield / Productivity	2	1	2
Product market access	1	1	2
Profit margin	2	2	2
Access to financing	2	2	2
Access to machinery	-1	0	1
Economic risks	0	-1	-2
Using local labor	-1	-1	2
Associativity development	2	0	1
Erosion	2	2	1
NR recovery time	1	1	2
Soil Organic mater	2	2	1
Protection RRHH	0	0	0
Environmental risk	2	2	1
Emissions reduction	2	2	1
Total	16	13	16

Figure 4.6.5: Workshop participants

4.6.3 How can we enable priority remediation options to be adopted?

With regard to the potential for adoption of the technologies, the main issues that were highlighted by the farmers and technicians are related to:

1. Accessing economic incentives for the adoption of conservation practices. To include the technologies developed in DESIRE as part of the incentive program for the “Recovery of Degraded Soils” managed by the Agriculture and Livestock Service (SAG) which implies:

- Adjusting incentives according to timing of the expenses and investments; and
- Conditioning incentives to the adoption of the technologies

2. Generating a participatory approach for further transfer and dissemination of the results, which implies considering the production systems and the goals of the farmers
3. Developing an adoption model with local leadership - coordination between institutions - long-term institutional commitments
4. Training for technicians to support the adoption of the technologies
5. Evaluating the economic and social impact of the soil conservation practices

The main challenges to improving adoption rates was the need for mechanization for adopting zero-tillage and sub-soiling. The solution the participants proposed was to create and promote small companies of agricultural machinery, managed by farmers themselves. Two examples already exist in the counties of San Carlos and Ninhue.

4.6.4 Feedback from participants

Feedback about the workshop

The comments received from participants about the workshop were generally very positive. Farmers and technicians highlighted the importance of these types of workshops in which they can give their opinions regarding to the policies and tools of soil conservation, which are promotes by the Ministry of Agriculture in the region and in the country. They expressed the lack of discussion forums on the topic and the necessity to participate in the decisions that involve them directly. In this respect the DESIRE project was an excellent opportunity to make their views known regarding the national program of soil conservation and the way they think, that such might be more effective.

Feedback about the project

Regarding the project itself, participants highly valued the fact of having participated in the project from the beginning. This greatly facilitated the discussion of the results. They assessed the quantity and quality of the results, especially concerning the technologies on non tillage, sub-soiling and the new crop rotations. This aspect will greatly facilitate the extension of the results. In fact the end of the workshop discussion turned around how incorporate effectively the technologies developed in the project, as part of the tools that the State funds. In this respect the farmers requested more transfer of technology, but through a participatory model with local leadership and many more co-ordination between Institutions and institutional commitment to longer term. They also detected weaknesses in the training of technicians, the only way to ensure the adoption of the technologies. They also emphasized the need to evaluate the Economic and Social Impact of the soil conservation practices.

4.6.5 Next steps

The following next steps were agreed:

- The results and agreements are being sent to participants in the week from 5 to 9 December, 2011. The slides with the research results will be available on the website www.geam.cl
- In relation to the commitments undertaken to improve the dissemination of the results, it should be emphasized that the responsible of the National and Regional of the Soil l Conservation Program were present in the workshop (German Ruiz from SAG, David Aracena from INDAP). They engaged themselves to incorporate the technologies developed DESIRE project, to the Integrated System to Recovery Degraded Soils (ISRDS) in order to improve the management plans that are funded to farmers
- The Ministry of Agriculture of Chile, through the Agricultural and Livestock Service, committed to continue supporting research and transfer of technology in the Soil Conservation practices, once the DESIRE project has finished.

4.7 China

4.7.1 Introduction

Six options were prioritized in the intial WB3 workshop: level bench terrace; reforestation; check dams; level groove on the slope; fish-scale pits; and mulching. Three of these were trialed in WB4 (details provided in Table 4.7.1).

Table 4.7.1: Description of remediation options trialed in the Chinese study site, including of brief description of the technologies (Dot), the nature of the desertification problems that need to be tackled in the study area (Dp) with accompanying photo and a short description of the results of remediation strategies (Dor)

Level bench terrace 	Dot: a kind of construction to make small flats on the slopes that could increase the infiltration of rainfall and the yield of crops. Dp: the soil erosion and water loss in this region is very severe and induce land degradation and lower output. Dor: - according to the survey in 2009, terrace (4500 kg/ha,maize; 3200 kg/ha, millet), slope cropland (maize 1100 kg/ha, millet 1200 kg/ha) - according to the simulating rainfall and small plots: no erosion terrace and 4800 t/km^2 on the slope of 20 degree with rainfall intensity (55 mm/hr) in 30 minutes
Check dams 	Dot: a kind of construction (check dam) on the downstream of gullies to silt the sediment from the upper streams induced by erosion on the slopes and gullies. After a certain time, the area in front of the dam would be check dam land with sufficient water and fertile soil for crops. Dp: to reduce the sediment delivery to the river from gullies, mitigate the gully erosion that would make the landform much broken. Dor: - according to the survey in 2009, terrace (7800 kg/ha, maize), slope cropland (maize 1100 kg/ha, millet 1200 kg/ha) - no erosion normally.
Reforestation	Dot: a kind of vegetation measure to increase the land cover by

	crone and residues to reduce the rainfall erosion energy and increase the infiltration of rainfall. Dp: the soil erosion and water loss in this region is very severe and induce land degradation and also induce the land broken. Dor: - according to the simulating rainfall and small plots: soil erosion rate with grass (70% of coverage) being 2400 t/km2 and 4800 t/km^2 on the slope of 20 degree with rainfall intensity (55 mm/hr) in 30 minters

The workshop was held with two sessions. The first session was held on 22 June 2011 with local farmers, including six village heads and two farmers from Zhenwudong Town, Ansai County, Yan'an City. These two farmers also carried out monitoring of soil erosion and soil water and conducted an economic survey. The second half of the workshop was conducted with policymakers at the county level on 23 June 2011, and was attended by:

- Mr. Su Wenlin, Deputy Director, Ansai Senior Association of Sciences (this association was founded by the former officials and local experts of Ansai County and almost all of them with plentiful local knowledge and experiences both in practices and management)
- Mr. Xue Shengming, Deputy Director of Ansai Bureau of Water Resurces (bureau for the soil and water conservation planning and implementation of projects, and water supply and resources protection)
- Mr. Bai Sunbao, Assistant of "Grain for Grain Project" Office of Ansai County
- Mr. Wu Ping, Assistant of Ansai Bureau of Forestry (bureau for forestry management, protection of natural forests, the forest right of local farmers)
- Mr. Xue Wei, Deputy-Director of Yan River Management Office, Ansai Branch (integrated river basin management office, normally concerning of all aspects of natural condition, policies and coordinating the different departments)

Additional interviews are planned with selected Goverment departments and experts in the following months to further disseminate project findings.

4.7.2 Priority Remediation Strategies

Table 4.7.1 shows that the priority remediation strategies selected in the initial WB3 workshop were also ranked in the same order after participants had been presented with evidence from field trials and modelling. The three strategies prioritised during the initial workshop are clearly the most important options in this region given their benefits in relation to ecological, economic and socio-cultural criteria. This was supported by field trial results. Other comments from workshop participants that help explain their rankings include:

- Flat land in the valley can be used soon after building check dams and will not suffer from siltation for 10 years or longer
- There are many terraces abandoned in Ansai County because they are far away from villages and the net income is very low, especially when considering the value of labour
- Reforestation could save time and enable land owners to obtain subsidies from the Government. Some participants also suggested how to improve the management of low-yielded forest

Table 4.7.1: Ranking of remediation options before and after field trials and modelling in China

Rank	Technologies ranked in WB3 workshop	Technologies ranked in WB4-5 workshop
1	Check dams	Check dams
2	Reforestation	Reforestation
3	Terraces	Terraces

3 How can we enable priority remediation options to be adopted?

The selected strategies should be compared carefully and shared with land managers and/or policy-makers widely to let them to know the benefits, especially the environmental impacts beyond of the direct economic benefits.

There is an on-going check dam engineering project called “Light-point Engineering” being run by the Ministry of Water Resources that will build many check dams to stop the delivery of sediment to the Yellow River. The Ministry of Agriculture has protected and encouraged local governments and farmers to protect the cropland area in the region since 1980, and terraces could be built and protected well under this policy, even though the economic return is lower for some time.

4 Feedback from participants

Feedback about the workshop was very good. The objective was very clear and all participants had a chance to express their opinions.

Feedback about the project was good. However, participants thought it would be better if there were more investment for the region.

4.8 Portugal

4.8.1 Introduction

In Portugal, forest fires are one of the major factors of land degradation processes. Affecting large areas every year, they also have serious human, socio-economic and environmental impacts. Under the DESIRE project, two Portuguese study sites were selected – Mação and Góis. Both study sites are located in Central Portugal and are frequently affected by forest fires. The main features of the Mação municipality (Figure 4.8.1) are as follows:

- Located on the northern bank of the Tejo River System (central Portugal);
- In a climatic transitional zone between Atlantic and Mediterranean;
- Altitude between 28 and 640 m;
- Rainfall from 1000 mm in the North to less than 600 mm per year in the South;
- Soils very shallow and stony / Humic cambisols;
- Steep slopes (> 20º);
- Schist and metamorphic rocks;
- Agro-silvo-pasture systems in the middle 20th century/ at the present forestry of *Pinus pinaster* and *Eucalyptus globulus* and shrubland;
- 7419 inhabitants / population density of 18,5 inhab/km^2 (2006);
- Birth-rate of 6,3‰ (2006);
- Death-rate of 23,1‰ (2006);
- Negative growth rate (-2,2% in 2006);
- 16% of the population works on the primary sector; and
- Ageing index of 379 (pop >65 years old / pop <15 years old *100).

The main features of the Góis municipality (Figure 4.8.2) are as follows:

- Located on the northern bank of Lousã Mountain (central Portugal);
- Altitude between 600 and 730 m;
- Rainfall about 1200 mm, concentrated during winter season;
- Soils very shallow and stony / Lithosols;
- Steep slopes (≈ 20º);
- Major land uses are dense shrubland and forestry, with small ruminants;
- Some experience in prescribed fire;
- 4499 inhabitants / population density of 17,1 inhab/km^2 (2006);
- Birth-rate of 7,3‰ (2006);
- Death-rate of 19,0‰ (2006);
- Negative growth rate (-1,17% in 2006);
- 15% of the population works on the primary sector; and
- Ageing index of 288.

Figure 4.8.1: Mação municipality – a) Land degradation; b) Human depopulation; c) Forest fires (2003); d) Forest fires directly affecting human lives.

Figure 4.8.2: Góis municipality – a) Human depopulation; b) *Pinus pinaster* forest with tracks c) prescribed burning

In 2008, the first stakeholder workshop was held in Mação municipality and the main aims were: to develop a mutual learning process between local and external stakeholders around land degradation and conservation processes; to identify the ones already applied and the potential strategies to mitigate the desertification processes; and finally to select the best technologies and approaches to be documented in WOCAT database.

One year later, the objectives of the second stakeholder workshop held in Góis were to: jointly select one or two options (mitigation strategies) from the WOCAT database to be implemented/ field-tested in the selected study site in the context of DESIRE WB4; and to strengthen trust and collaboration among concerned stakeholders. During the workshop there was a proposal for conducting a third workshop to verify the implementation of selected technologies.

The following remediation strategies that were tested in WB4:

- **Primary Strip Network System for Fuel Management:**

  The Primary Strip Network System for Fuel Management aims to redesign the landscape, through the establishment of discontinuities in the vegetation, in forest areas and in the rural landscape (for example using water bodies, agricultural land, pastures, rocky outcrops, shrubland and valuable forest stands).

  These primary strips are ≥ 125 metres width and preferably between 500 and 10,000 ha in surface area. The tree cover should be less than 50% of the area and the base of the tree canopy should not be lower than 3 metres.

  The main objectives of this technology are: to decrease the area affected by large fires; to enable the direct intervention of fire brigades; to reduce fire effects and protect roads, infrastructures and social equipment, urban areas and forest areas of special value; and to isolate potential fire ignition sources.

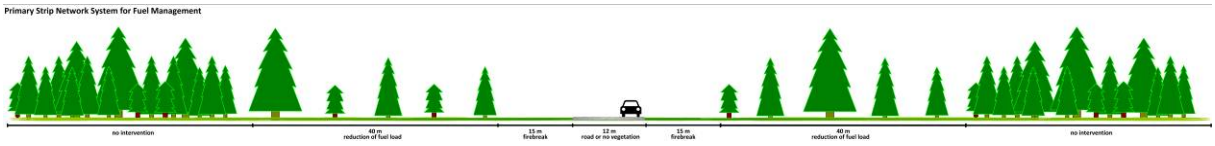


Figure 4.8.3: Technical specifications, dimensions and spacing for the Primary Strip Network System for Fuel Management

- **Prescribed Fire**

  The use of prescribed fire (or 'controlled burn') aims to reduce the fuel load in form of the live and dead plant material and thus, to prevent the likelihood of more damaging wildfire.

  This technique is an essential management tool that applies fire to control the quantity of forest or scrubland fuels. The type of fire depends on the specific goals and on the weather conditions.

In the first case it is important to consider the slope and the type of fuels to be burned. Weather conditions include temperature, wind direction and air humidity. Another important aspect is the ability to control the flame propagation velocity (Figure 4.8.4).

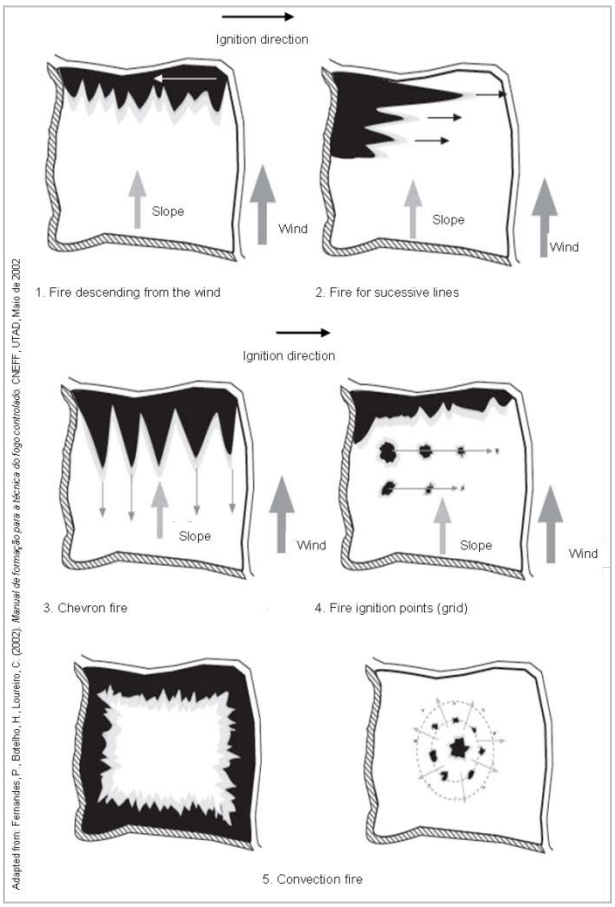


Figure 4.8.4: Prescribed fire implementation types and its specifications

Thus, the aims of the third workshop were: to share and evaluate results from WBs 4 and 5 with stakeholders; and agree recommendations for agricultural extension; and national/local policy that can also be disseminated to a wider audience; to discuss whether the remediation technologies and approaches that gave positive results will be sustained into the future and identify the role of different stakeholders in doing this; and to evaluate how the project results can inform future needs and agendas.

The workshop started with three presentations with the aim to introduce: the DESIRE project, the WB4 trial results and the WB5 model outputs. The presentation of the DESIRE project was made by using the DESIRE film showing the Portuguese study sites, and a power-point presentation with the re-cap of the main results from the first and second workshops.

Concerning the WB4 trial results, two presentations were made by the study site coordinators. These presentations tried to integrate the main results from the field trials, but at the same time, in a simple and easy manner so stakeholders could understand.

On the other hand, the WB5 presentations showed the PESERA model outputs. The model provided a multi-year cost-benefit analysis for applying the technique, using as an example the Mação

municipality. Results for Góis were not yet available, it was stated that they could be sent upon request to the interested stakeholders later on.

Participants were very interested in the presented subjects, having provided a healthy, brief Q&A period at the end of the presentations.

4.8.2 Priority Remediation Strategies

The aim of this exercise was to revisit criteria used in WB3 and re-evaluate the different technologies (primary strips network system for fuel management and prescribed fire), using the FACILITATOR software.

This exercise started highlighting the main results and conclusions of the workshops 1 and 2, either to refresh the memory of the previous participants or to inform the new ones.

As identified in workshop 1, the primary objective is the **reduction of the burned area**. The population abandonment and ageing that are occurring in the study areas, are closely related to forest fires occurrence; so it was mentioned that a reduction of the burned area will also demand the adoption of measures and policies to boost the local socioeconomic structure.

Under the first workshop, two technologies were identified to be documented in the WOCAT database - Primary Strip Network System for Fuel Management and Prescribed Fire.

The participants were asked if they still remembered the criteria selected in the second workshop and after that, they were invited to propose changes to the criteria (Figure 4.8.5). Just one criterion was changed, where the *increase of water availability* was replaced by *disturbances in water cycle* (Table 4.8.1).

It was considered important to divide the participants into three distinct (random) groups. For the participants these two technologies are complementary. Thus, we used the FACILITATOR software, but the assessment for the technologies was done separately.

In order to apply the FACILITATOR software, participants were asked to score the technologies by each criterion. This was made by using a scale from 0 to 10, where 0 is the worst and 10 the best option (Figure 4.8.6). The score 0 means that a technology performs so poorly on that particular criterion that it is probably not viable (killer criterion).

The charts from the three groups clearly show that the two technologies are located above 5 (i.e. in the top half), which means that they are good options concerning sustainable development.

The final results from this workshop compared with the results from the workshop 2 were higher. This may have occurred due to the increased of the know-how of the technologies, since there are already implemented in the study sites.

Figure 4.8.5: Overview of the participants and final result of the criteria per category

Figure 4.8.6: 'Scoring tool'

Table 4.8.1: Revised criteria per category

Categories	Criteria
Ecological	Soil conservation
	Improve biodiversity
	Disturbances in water cycle
Economic	Diversification of economic activities
	Implementation costs
	Maintenance costs
Socio-cultural	Population settlement
	Social acceptance of the technology
	Safety of people and goods
	Improve landscape quality

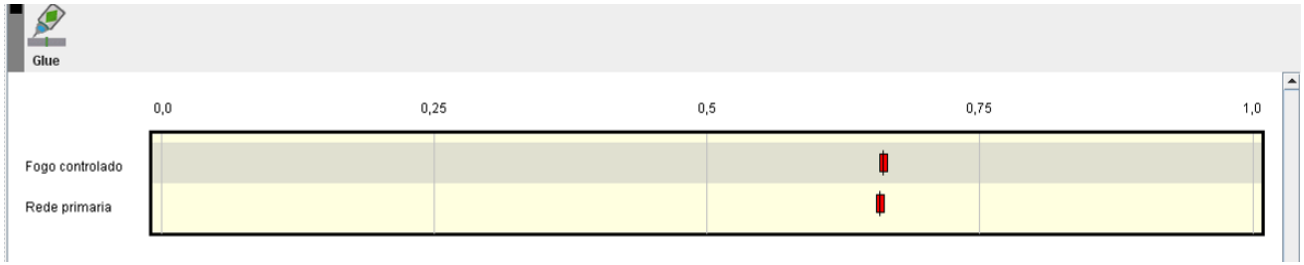


Figure 4.8.7: Overall result of the evaluation of technologies (spades group)

Table 4.8.2: Results of the scoring technologies – spades group

	Ecological			**Economic**			**Socio-cultural**			
	Soil conservation	Improve biodiversity	Disturbances in water cycle	Diversification of economic activities	Implementation costs	Maintenance costs	Population settlement	Social acceptance of the technology	Safety of people and goods	Improve landscape quality
Primary Strips Network System for Fuel Management	**5**	**5**	**7**	**8**	**5**	**6**	**7**	**7**	**8**	**9**
Prescribed Fire	**8**	**8**	**7**	**6**	**9**	**8**	**2**	**4**	**7**	**5**

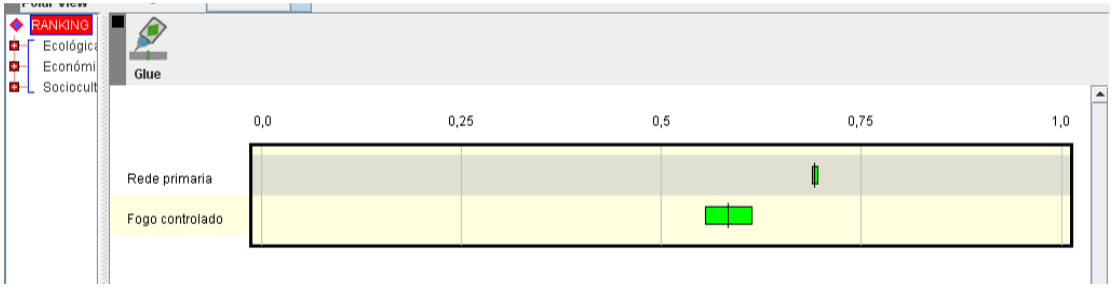


Figure 4.8.8: Overall result of the evaluation of technologies (hearts group)

Table 4.8.3: Results of the scoring technologies – hearts group

	Ecological			**Economic**			**Socio-cultural**			
	Soil conservation	Improve biodiversity	Disturbances in water cycle	Diversification of economic activities	Implementation costs	Maintenance costs	Population settlement	Social acceptance of the technology	Safety of people and goods	Improve landscape quality
Primary Strips Network System for Fuel Management	**7**	**8**	**8**	**9**	**2**	**4**	**9**	**7**	**9**	**8**
Prescribed Fire	**5**	**6**	**5**	**5**	**10**	**10**	**5**	**3**	**8**	**3**

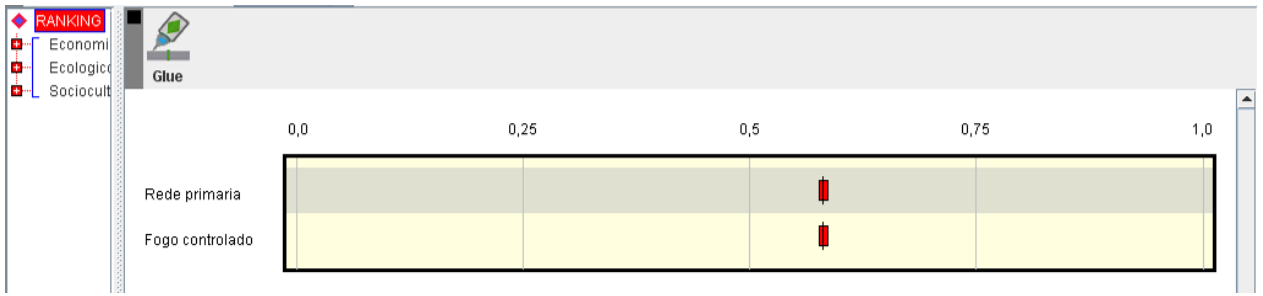


Figure 4.8.9: Overall result of the evaluation of technologies (diamonds

Table 4.8.4: Results of the scoring technologies – diamonds group

	Ecological			**Economic**			**Socio-cultural**			
	Soil conservation	Improve biodiversity	Disturbances in water cycle	Diversification of economic activities	Implementation costs	Maintenance costs	Population settlement	Social acceptance of the technology	Safety of people and goods	Improve landscape quality
Primary Strips Network System for Fuel Management	**6**	**7**	**4**	**7**	**3**	**5**	**6**	**8**	**8**	**5**
Prescribed Fire	**5**	**6**	**3**	**8**	**6**	**7**	**7**	**5**	**8**	**7**

4.8.3 How could we facilitate the adoption of the priority remediation options?

This activity intends to prioritize the measures and implementation actions, in order to promote the adoption of the studied techniques (Primary Strip Network System for Fuel Management and Prescribed fire).

The exercise was highly participatory in character, ensuring that stakeholders were able to define the trajectory to follow in order to promote the techniques. As a development methodology, the previously defined workgroups were maintained.

After explaining the exercise to the participants, the base question for group discussion was established: **"How could we facilitate the adoption of the priority remediation options that have emerged at the study site scale?"**, keeping in mind the main goal already identified in the first workshop "reduction of the burned area" (Figure 4.8.10).

After the group analysis and discussion, each workgroup named a representative to present their findings (Figure 4.8.11).

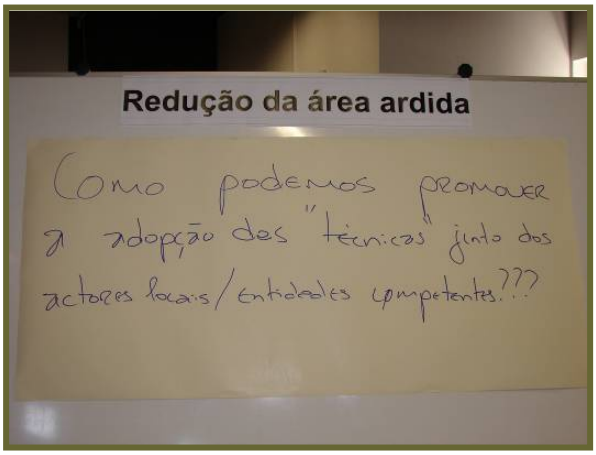


Figure 4.8.10: Initial question

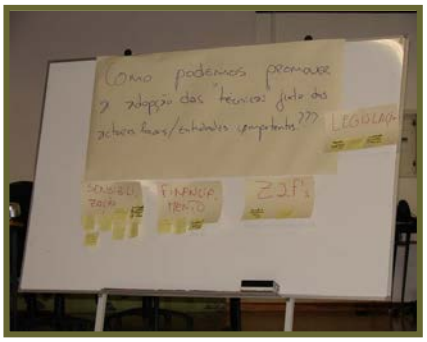
After presenting the results, a global discussion of the subject at hand was promoted in order to evaluate the participant's sensitivity to the theme, as well as to integrate the "why" of the presented solutions with the existent available mechanisms to reduce burned areas. As a main goal, it was intended to know the perspectives of the local stakeholders, in order to define if their opinions were complementary or divergent. It was also possible to establish a categorization of the presented options (Figure 4.8.12 and Table 4.8.5, respectively).

Workgroup discussion	Results presentation
	
	
	

Figure 4.8.11: Discussion and results presentation


Figure 4.8.12: Discussion to categorize the presented options

Table 4.8.5: Categorization of the presented options

Final Result	Categories	Main actions
	Regulation	- Legislation reformulation - Simplified cadastral survey - Bureaucracy simplification / Law clarification
	Forest Intervention Areas	- Promotion of association membership - Forest Intervention Areas as a vehicle for sensitization to certify of the process implementation
	Funding	- Incentives - Financial mechanisms - Economic valorisation of forest residues (proceeding from the management of the Primary Strip Network System for Fuel Management)
	Awareness	- Forest sectorial entities dynamics - Society sensitization at the regional, local and interested associations level - Installation of the demonstration areas - Presentation of real cases in order to demonstrate the success of implementation of the Primary Strip Network System for Fuel Management - Forest operational actions - Forest Technical Offices actions (namely, to fulfil what is established in Law 20/2009) - Rural population sensitization to the advantages of using prescribed fire as a fuel management technique (relationship with agroforestry)

There was consensus that the sensitization and the Forest Intervention Areas were an important vehicle to promote the sustainable use of the forest. Application of the Primary Strip Network System for Fuel Management and Prescribed fire techniques was also deemed relevant. The need to clarify legislation and enhance incentives were pointed out by stakeholders.

Finally, the presented solutions were ranked by workshop participants (score 0 to 10, being 0 the lowest and 10 the highest scores). The findings are presented in Figures 4.8.13 and 4.8.14.

Figure 4.8.13: Results from hierarchizing the future actions category

By ranking the possible actions, a consensus was reached over the sensitization and Forest Intervention Areas actions. However, disagreement was apparent over legislation and financing topics, having on one side the local actor's interest and, on the other, the competent management entity (AFN).

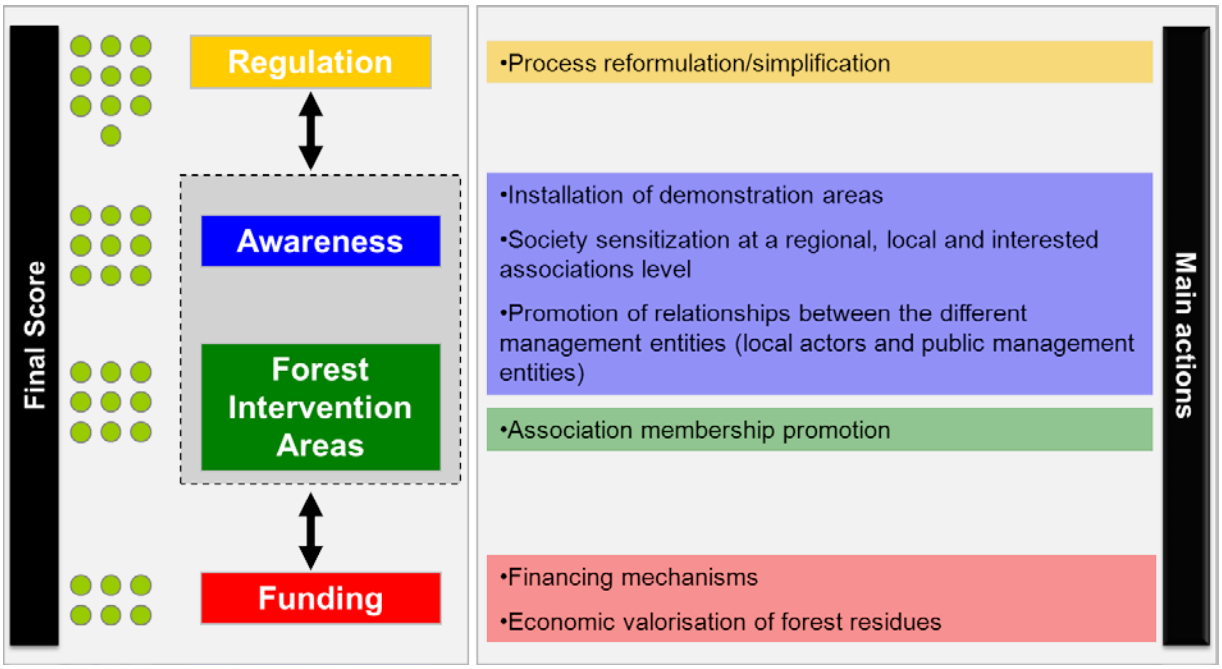


Figure 4.8.14: Systemizing the defined hierarchizing for the technique promotion

In summary, local actors have difficulty in understanding aspects of the relevant legislation and how to implement it. This results, from the absence among the local actors of consensus between the goals and the management options that are available for their forest areas. This comes as a consequence of the individual ownership structure, which hampers the creation of a scaling effect to implement the techniques and take into account the individual interests of each landowner. In this aspect, the AFN representative considered that it is a problem that resides in the management structure (that doesn't exist) and, in this respect, the competent management entity can't really help. This stakeholder also noted that the supporting mechanisms are created, accessible and available, and that the local actors are the ones that don't seek them (once they require a management structure with a scale that doesn't exist). Because of this, the AFN representative considers this a problem of the local actors and not of AFN's availability. This is really the focal point of disagreement between the entities. However, it was considered that, with the sensitization and Forest Intervention Areas, the local actors can develop their knowledge of the techniques, being used as a driving force to change the way the forest properties are managed. It was reckoned that a simplification/clarification of the legislation is an important step so that the techniques are adopted. The valorization of the biomass residues (resulting from management operations of the Primary Network, for example) was proposed as a vector to achieve self-sufficiency in forest management. This aspect has been unanimous between the different participants. Nevertheless, this valorization will only be achieved with a scale effect that is permitted by the interested associations, being an increase in economic value in forest management.

4.8.4 Feedback from Participants

By participants (local and external)

The evaluation of the workshop was made using the sticky dots (Figure 4.8.15). Six parameters were written in a flip-chart paper, the scale for the evaluation was ☺ - good, 😐 - medium and ☹ - bad.

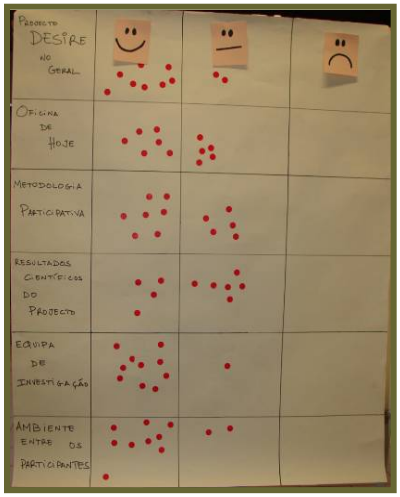


Figure 4.8.15: Results from the workshop evaluation

Participants gave a "good" rating to the role performed by researchers, to the DESIRE project and to the atmosphere generated between all participants. However, the participants were divided between good and medium, concerning the DESIRE workshop 3, the participatory methodology and the scientific results generate by the project.

By the moderator(s)

The workshop was performed in a central point for the two study sites making easier the participation of the local stakeholders. Half of the participants in workshop 3 were new, which justified the satisfaction concerning the participatory methodology.

4.8.5 Next steps

The following next steps were agreed:

- All participants will receive the workshop report as well as further publications of DESIRE
- New research projects are on-going and will maintain contacts with local stakeholders and, hopefully, follow up DESIRE field activities
- Agreed actions to disseminate

4.9 Tunisia

4.9.1 Introduction

Since the privatization of communal tribal lands, production systems have changed rapidly in Zeuss-Koutine, Tunisia, with natural resource exploitation increasing (via exploitation of groundwater aquifers and rapid expansion of fruit orchards) at the expense of semi-natural grazing lands. This has resulted in an accelerated rate of land degradation and higher risks of desertification.

Figure 4.9.1: Land degradation in Zeuss-Koutine, Tunisia: i) soil erosion by water; and ii) rangeland degradation by overgrazing

To tackle these challenges strategies selected by local stakeholders as part of the DESIRE project were based on water harvesting and improving the condition of grazing land. Strategies were selected on the basis of the biophysical and socio-economic characteristics of the study site and local knowledge/preferences. Three locations were selected within the study site, where a combination of remediation strategies trialed:

- Lathmen: Jessour, Tabia, supplemental irrigation and resting
- Zammour: Jessour, Tabia and supplemental irrigation
- Bahayra: Spreading groundwater recharge and Tabia

4.9.2 Priority Remediation Technologies

The scoring of the technologies at the WB3 stakeholder workshop (2008) and the final workshop (2011) at the three sites (Bhayra, Lathmane, Zammour) are given in Table 4.9.1.

Table 4.9.1: Stakeholder scores for remediation strategies in three locations in the Tunisian study site (note: blank scores in the 2011 column indicate that a remediation strategy was not trialed and so not re-evaluated)

Bhayra	**Score 2008**	**Score 2011**
Stone ridges	5.0	
Flood spreading & Recharge units	5.1	5.3
Tabia and jessour	6.6	5.4
Cisterns	4.9	
Range resting	5.0	
Medicinal herbal and aromatic plants	2.9	
Supplement irrigation	5.6	

Lathmane	**Score 2008**	**Score 2011**
Stone ridges	7.0	
Flood spreading & Recharge units	6.6	
Tabia and jessour	8.0	7.4
Cisterns	4.9	
Range resting	4.9	5.1
Medicinal herbal and aromatic plants	3.7	
Supplement irrigation	6.3	5.2

Zammour	**Score 2008**	**Score 2011**
Stone ridges	4.3	
Flood spreading & Recharge units	6.9	
Tabia and jessour	7.4	3
Cisterns	6.4	
Range resting	4.7	
Medicinal herbal and aromatic plants	7.1	
Supplement irrigation	6.1	5

Table 4.9.1 shows that, except for “flood spreading & recharge units” and “range resting”, most of the technologies were given lower scores after workshop participants had been presented findings from field trials and models. However, it was noticed that for the jessour, the score falls from 7.4 to 3 in the Zammour zone, reflecting either a dissatisfaction with respect to this technique or an initial overestimation of the impacts. This result should be explored through further investigations.

Table 4.9.1 was discussed with the stakeholders during the workshop, who mentioned that:

- The same evaluation criteria had been maintained between the two workshops
- Due to the short monitoring period and the occurrence of droughts, the farmers focused on priority technologies
- Focus was made on the technologies having direct impacts on the income of the farmers

Table 4.9.2: Ranking of remediation options before and after field trials and modelling in Tunisia (based on average scores between the three locations that were considered)

Rank	Technologies ranked in WB3 workshop	Rank	Technologies ranked in WB4-5 workshop
1	Tabia and jessour	**1 =**	Flood spreading & recharge units
2	Flood spreading & recharge units	**1 =**	Supplement irrigation
3	Supplement irrigation	**2 =**	Medicinal herbal and aromatic plants
4 =	Stone ridges	**2 =**	Cisterns
4 =	Cisterns		
5	Range resting		
6	Medicinal herbal and aromatic plants		

3 How can we enable priority remediation options to be adopted?

In order to enable priority remediation options to be adopted, the following suggestions were made by workshop participants:

- Consolidate further the synergies between research programs and development projects so as to ensure a rapid and smooth promotion of remediation strategies

- Ensure maintenance of traditional techniques and local know-how in the management of natural resources while introducing improvements where it is relevant. However, site specific conditions should be taken into account
- Integration of those remediation strategies in the regional/local action plans for combating desertification and climate change impacts mitigation
- One of the major obstacles that needs specific attention is the migration of rural population into the cities for the search of alternative income generation sources and better living conditions. Therefore, diversifying the economic activities in those areas is a corner stone for any sound sustainable development plans

Figure 5.9.2: Participants during final workshop discussion in Tunisia

4 Feedback from participants

The following feedback was obtained from participants about the workshop and the overall DESIRE project:

- The participants said that it was a very good opportunity to debate frankly key issues relevant to the management of the natural resources in the region. Others participants requested to organize more frequently such events
- They highly encouraged the synergies between all the partners: research, development, policy, regional and international cooperation
- Though the direct contribution of the project was relatively not so very important, the farmers were very enthusiastic about the undertaken actions
- The major challenge: how we can have significant impacts with limited funding and harsh natural environment

5 Next steps

The following next steps were agreed:

- Participants and stakeholders and policy makers will receive workshop report by the end of October 2011;
- The field monitoring and assessment of the engaged actions will be continued within other projects; and
- The remediation strategies will be implemented within the framework of on going and future development projects.

4.10 Greece (Nestos)

4.10.1 Introduction

During the decades of ’50s and ’60s, a variety of flood-controlling engineering works were constructed, in the eastern plain of Nestos River Delta (West Thrace, Greece) in the framework of “conceived wetlands management system”. These works included river diversion, caisson, modification, draining of wetlands and construction of drainage canals. These interventions have been carried out without any provision for the induced changes in the ecological balance and the interruption of groundwater recharge regime. With the progressive implementation of land improvements, the arable area was protected from the floods and significantly expanded. Furthermore, the expansion of the cultivated land required additional quantities of irrigation water, in local scale and a large number of groundwater wells were installed. Thus, groundwater table declined during the following years and seawater intruded into the coastal aquifers up to several kilometres inland, causing soil salinization.

Water and soil salinization is a major threat for irrigating agriculture in the East Nestos delta river. Almost, 10 km^2 of land in the study area have been devastated by high concentrations of soluble salts and exchangeable sodium. Some recent results for groundwater salinization are shown in Figure 4.10.1. It is evident that ~15 km^2 of the unconfined aquifers are hindered problematic with increasing quantities of soluble salts. Consequently, the soil quality for agricultural purposes is often problematic.

For this reason, stakeholders working with the DESIRE project identified fresh water transport as a key remediation strategy, which was subsequently trialed. The strategy is to use freshwater from local streams for irrigation purposes, in order to replace the traditional irrigation way (by pumping saline ground water from wells). The major inputs of the technology are a pumping station placed by the stream/river, pipe network for water transport and diesel or electricity for pump operation.

Figure 4.10.1: Saline-sodic soils in the coastal area of Maggana

Figure 4.10.2: Soil desertification due to accumulation of salts

4.10.2 Priority Remediation Strategies

The main remediation strategy (fresh water transport) was discussed during the final workshop. The presentation of the lab analysis results showed that the use of fresh water for irrigation not only improved soil characteristics but also doubled the crop yield. Additionally, despite the high establishment cost (pumping station, network pipes), the technology seemed to be cost effective according to DESMICE model outputs. After debating the applicability, the labour required, the efficiency, the environmental impacts and the costs involved, the technology remained prioritised by participants, who were more in favour of the technology than they had been during the previous workshop where the technology had originally been selected for trial. Thus, the participants were willing to adopt the technology.

4.10.3 How can we enable priority remediation options to be adopted?

After a thorough discussion it was decided that the best way to disseminate the selected strategy is through local Agricultural Unions and the Regional Department of Water Management. Also, the adoption of the remediation strategy can be achieved through local press and small debates at local coffee shops.

One barrier towards broader application of this technology that must be altered in the study site is the local water policy. The latter permits water transportation in a distance not higher than 500 m from the water source. Consequently, the permission for water usage and accordingly the permission to install of

an electrical supply for pumping station operation can take place only within those distance limits (500 m).

Another thing that was mentioned in the workshop concerns possible future subsidies from EU in order to apply the remediation technology.

Figure 4.10.3: Workshop participants during discussion in Nestos Basin, Greece

4.10.4 Feedback from participants

The third Workshop was organized in the facilities of Democritus University of Thrace. The overall aim of this workshop was to inform local stakeholders with recent outcomes of implementation and the monitoring of the reclamation strategy. In this workshop participants (except our research personnel) from the Regional and Local Department of Water Management, the District of Agriculture and only one farmer (owner of the study plot) were present. Taken into account the promising results of the research which showed a crop increase around 100% and better soil characteristics, after the implementation of the remediation strategy, the feedback from the participants was positive and they agreed to compel things in order to change the water policy concerning the legal water transport distance.

The participants were also interested in some other study sites of “DESIRE” project besides Nestos River Basin especially about how these partners not only applied a certain technology but also how they managed to disseminate such information and make it more accessible to local farmers. They found some ideas like the Harmonized Information System (HIS) really intriguing and they seemed willing to help in order to achieve the desirable dissemination of such information within the region.

4.10.5 Next steps

The following next steps were agreed:

- Alteration to water transport legislation must be applied in order to cover bigger parts of (eastern) Nestos Rivers Basin with fresh surface water for irrigation. But, first of all a detailed hydrological/hydrogeological study in the area must be conducted to determine water quantity and quality in the basin
- It was proposed to the participated stakeholders to try to promote the SLM technology to more farmers of the study area, as well as to other areas of the region that faces similar problems
- Participants were informed about the workshop report orally and by fax

4.11 Greece (Crete)

4.11.1 Introduction

Crete is subjected to high desertification risk due to various reasons. Pasture land is among the areas at greatest risk. In recent decades, degraded agricultural land has been abandoned and converted to pasture to provide low cost and high quality animal products. Consequently, the livestock population on the island has more than doubled in the last three decades, exceeding recommended stocking rates, and resulting in overgrazing. The resulting degradation of the vegetation has contributed to high erosion rates. Overgrazing is considered to be the main cause of desertification in the island.

For that reason, an experiment was carried out as part of the DESIRE project, near Agia Barbara village, on a steeply sloping area of overgrazed land (23% slope) with shallow soil (35-45 cm deep). Four runoff plots were established to represent two alternative practices (for details see WB4 documents):

- Sustainable grazing (Figure 4.11.1); and
- Overgrazing (Figure 4.11.2)

Figure 4.11.1: Overgrazing

Figure 4.11.2: Sustainable grazing

Figure 4.11.3: Participants in final DESIRE stakeholder workshop

Figure 4.11.4: Workshop presentation – C. Karavitis (facilitator)

The workshop consisted of presentations of findings from previous WBs, followed by a stakeholder workshop where Prof. Karavitis (facilitator) tried to build consensus among participants by asking them to express their opinions about land degradation in the study area and what they think should be done to remediate this degradation. The technique that was followed, was the Nominal Group Technique (Figure 4.11.5), where a formed group discusses an issue or a problem (desertification in this case), guided by a facilitator. The ideas expressed, generate individual lists and when a final list of options is compiled, the ideas are discussed to be clarified and a composite list is created.

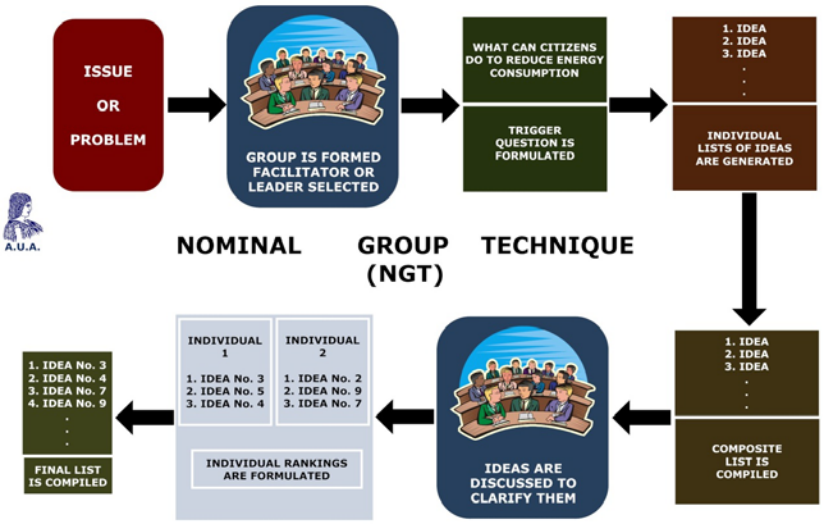


Figure 4.11.5: Example of Nominal Group Technique

All the answers were recorded on flip chart sheets, easily readable from across the auditorium (Figure 4.11.6). Care was taken to ensure participants were not guided towards certain preferences or preferred actions. After the final option list was completed, the participants were called to vote the best solution for the mitigation of desertification and land degradation in general (Figure 4.11.7). From the 39 persons, only 33 voted, giving the 10 points to their most preferable choices except the Vice Major who replaced the Major of Agia Barbara and voted with 15 points.

Figure 4.11.6: Noting the expressed opinions – D. Stamatakos

Figure 4.11.7: In front of the option list – from left: V. Fassouli, Vice Major of Agia Barbara, C. Karavitis

4.11.2 Priority Remediation Strategies

Evidence from field trials and modelling showed that the proposed remediation strategy increased vegetation cover and hence reduced erosion rates, leading to higher soil organic matter content, reduced soil surface crusting, higher biodiversity and reduced desertification risk in plots where sustainable grazing practices had been followed. In addition to this, sustainable grazing practices were found to be cheaper to implement than current practice (for details, see WB4 findings). For this reason, workshop participants agreed that the proposed remediation strategy could be recommended for further dissemination.

4.11.3 How can we enable priority remediation options to be adopted?

The experiment's results were more or less expected since more sustainable grazing practices reduce many of the pressures that are currently leading to land degradation in the study area. Nevertheless, such activities usually present other drawbacks, especially of an economic nature. As such, workshop participants were concerned that the current level of subsidy they receive from the EU is linked to the number of animals they own, and so lower stocking rates could lead to a drop in subsidies.

Thus, the application of sustainable grazing requires additional funds to compensate for subsidy losses due to reduced stocking levels, or to buy additional feed to keep livestock housed inside for certain periods (to allow the land to rest). The funding required was estimated at about 7 Euros per animal. An alternative suggestion that was made during the workshop was to spread livestock out over wider areas, to reduce grazing intensity, however there are land ownership, tenure and financial barriers to this.

Despite the lack of funds, sustainable grazing received a satisfactory score when compared to alternative options that could be considered by decision-makers (Table 4.11.3). This score suggests that local farmers are interested in adopting more sustainable grazing practices, as long as this does not compromise their incomes.

Table 4.11.3: Sustainable grazing compared to alternative options for reducing land degradation in Crete, ranked according to votes from participants taking part in a DESIRE stakeholder workshop

A/A	OPTIONS	POINTS
1	Construction of small dams	55
2	Overgrazing control	46
3	Underground water recharge	38
4	Wider planning	30
5	Water resources management	27
6	Political decisions	25
7	Law enforcement	23
8	Public awareness	20
9	Natura sites protection	16
10	Erosion control	15

11	Agricultural practices	13
12	Environmental sensitivity	12
13	Legislative framework	10
14	Analytical Hydrological Research	5

4.11.4 Feedback from participants

Despite the participants' enthusiasm about the DESIRE approach, a problem occurred concerning the fact that the whole WOCAT system and processes are available only in English. Many of the participants stated that they will need further support in order to use it and benefit from the information that is offered.

One positive issue that occurred is the fact that local authorities and stakeholders are willing to participate in the battle against desertification as long as their profit is not threatened. And in times like the current ones such a reaction is more than understandable and respected.

4.11.5 Next steps

It was agreed that AUA will work as closely as possible with local stakeholders and other interested groups that would like to use/apply the DESIRE methodology, and they will support the area with further research.

4.12 Morocco

4.12.1 Introduction

In the Sehoul area of Morocco, the main desertification problem consists of vegetation retreat, soil chemical degradation, and soil erosion, including incision of channels at the expenses of former colluviums and alluviums. Priority remediation strategies, as selected in the WB3 workshop, were designed to restore degraded pastures (particularly those incised by badlands) and to improve the productivity of annual cultivations. The remediation strategies that were selected and trialed were:

- **Protection of pastures affected by gullies and rills**, by fencing and the plantation of fodder shrubs (atriplex). The objective is to demonstrate that the grazing areas can be more productive (with a higher biodiversity) and at the same time less eroded if the soil cover is protected and improved. By September 2011, 2.5 years after plantation, the plot has obtained a really new landscape, compared to the fallows surrounding, even there where the gullies are not developed (Figure 4.12.1). Comparison between the behavior of 3 plots, 2010-11, the natural matorral, the eucalyptus plantation and the atriplex + fencing plot: The atriplex plot shows the best results in term of land cover by herbs, namely the permanent ones, and the less bare soil.
- **Fencing and minimum tillage:**
    - Conservation, after harvest, of the crop residues in summer and autumn, before the first rains to reduce evaporation and the soil disturbance by animal grazing; and
    - Minimum tillage to improve the soil on quite steep slopes devoted to annual cultivations.

These strategies were selected primarily because they constitute a continuation of the traditional way of life in the area. Additional criteria used to evaluate the strategies were agreed by both technicians and farmers during both the initial WB3 workshop and the final workshop.

Figure 4.12.1: Recovering of the land after two years of management in Sehoul, Morocco. The rill inside the plot recovered, while the one outside is wider; the color of the surface changed in the planted plot, due to grass growth

4.12.2 Priority Remediation Strategies

In response to field trial and model results, workshop participants concluded that:

- It becomes evident that the fruit trees, like olive trees represent a possible sustainable future for agriculture in many regions in Morocco;
- The grazing areas represent an important resource, if the land is better managed and the yield of fodder improved
    - The economic criteria of yield and income, already used in the WB3 workshop, was evaluated as more important than any others
    - The debate also raised the question of representativeness of the research led by the team, in particular the experiments. These concerning plots limited in extension and lasted only a reduced time. Besides the problem is to transfer what produces the research in the field of the application on the ground. The various offered alternatives are not quite practicable by the average developer and even less by the small farmers, what means the difficulty of scattering of experiments, even if they showed their abilities in the plots of some farmers.

As a consequence, the rank order of remediation strategies changed between the initial WB3 workshop and the final workshop, as shown in Table 4.12.1.

Table 4.12.1: Ranking of remediation options before and after field trials and modelling in Morocco

Rank	Technologies ranked in WB3 workshop	Technologies ranked in WB4-5 workshop
1	The improved system based on cereal cropping with rotation, plus grass strips	The cereal/leguminous system mixed with olive trees, figs trees; cactus opuntia and runoff water harvesting, in order to improve the production and restore the lands fertility
2	The improved system based on grazing and cereal cropping with control of the gullies	The protection of existing grazing lands, forests and former cultivated areas
3	The cereal/leguminous system mixed with olive trees and runoff water harvesting	The improved system based on grazing and cereal cropping with control of the gullies

4.12.3 How can we enable priority remediation options to be adopted?

Workshop participants made the following suggestions:

- The strategy of the farmers is influenced by the two main traditional activities, annual crops for food production and livestock for immediate income
- The farmers are more concerned by their immediate income than by sustainability and by the long term effects; it is then necessary to alleviate their level of conscience and at the same time make the remediation techniques profitable and have a real effect on their income
- The selected actions must be simple and easy to reproduce, in order to facilitate their gradual adoption by other farmers
- The coordination of Agriculture and Forests is a requirement, because of the very strong links between the 2 domains, state forest domain but on used in spite of the law and the private lands, used for the agricultural production and for grazing
- The choice for a better management of the cropped areas and the improve of the cover of the degraded pastures seems to be less costly and more immediately productive than deep changes in term of traditions
- Incentives to land users are recommended to exclude grazing and to plant fodder shrubs in order to prevent soil erosion and stabilize gully formation
- Bold political decisions are needed to reverse the trend and challenge of natural resource degradation and desertification
- It is also urgent to identify new legal contexts that can enable effective implementation of reforms and improvements

Figure 4.12.2: Workshop participants listening to results from field trials and models in Morocco

4.12.4 Feedback from participants

The following feedback was elicited from workshop participants:

- The technicians and engineers adopted easily the methodology and were able to lead deep discussions and a real debate about the questions posed by the moderator, while the local farmers didn't appreciate the method of participation
- The Engineers didn't appreciate a lot the research protocol and were suspicious with some of the results

4.12.5 Next steps

The following next steps were agreed:

- Agreement with the Regional service of Agriculture to meet in autumn for the follow up of the workshop.
- Agreement with the stakeholders to prepare a communal project of development for the territory, integrating sustainable land management vision

4.13 Botswana

4.13.1 Introduction

The most glaring constraining factors for soil and water conservation in Botswana are poverty (limited financial resources), lack of livelihood alternatives to those which are land based, lack of information on available innovation and technologies and low levels of literacy. Land degradation issues in the Boteti study site in Botswana include:

- Water shortage
- Drought
- Poverty
- High livestock mortality
- Loss of vegetation cover
- Heat and dust

To tackle some of these issues, the following remediation strategies were suggested by stakeholders in the WB3 workshop:

- Game ranching
- Biogas production
- Rainwater harvesting
- Solar cookers

Game ranching scored the most under all the criteria that were selected during the WB3 workshop (Table 4.13.1). However after discussions consensus was reached to pilot bio gas production as it was deemed the most affordable and practical for local farmers.

Figure 4.13.1: Cattle crossing a salt pan in Boteti District, Botswana

Participants discussed the criteria used in the WB3 workshop to assess their suitability for use to evaluate the bio-gas technology in the final workshop. Some aspects were found to be relevant and others were removed. New ones were added as shown in Table 4.13.2. Beans were used for all ranking and evaluation due to low literacy levels. For evaluation of the technologies the participants were each given five beans representing a scale of 1-5 (very poor, poor, average, good, very good). For ranking ways of facilitating adoption of remediation technologies participants were given ten beans as the aim was to rank.

Table 4.13.1: Criteria used to select remediation strategies for trial during WB3 workshop in Botswana

Economic	Ecological	Socio-cultural
Education	Reduce degradation and improve appearance and state of the environment	To promote cooperation, self reliance and volunteerism.
Employment	To protect the ozone layer	To conserve culture and natural resources
Profit	To improve harvests	To alleviate poverty

Table 4.13.2: Criteria used in final workshop to evaluate remediation strategy trialled and modelled during WB4-5 in Botswana

Economic	Ecological	Socio-cultural
Education	Reduce degradation and improve appearance and state of the environment	To reduce domestic work load
Employment	To protect the ozone layer	To alleviate poverty
Profit	To improve soil fertility and increase yields	Suitable for local conditions
Startup capital	To conserve natural resources	

Table 4.13.3: Evaluation of bio-gas versus traditional firewood against economic, ecological and socio-cultural criteria defined by participants during final DESIRE workshop in Botswana. Scores are based on votes cast by participants using beans as counters, aggregated using FACILITATOR software

Economic	Bio-gas	Firewood	Ecological	Biogas	Firewood	Socio-cultural	Bio-gas	Firewood
Education	**4.63**	**0.38**	Reduce degradation and improve appearance and state of the environment	4.9	0.38	To reduce domestic work load	4.9	1.13
Employment	3.5	0.38	To protect the ozone layer	4.75	1.13	To alleviate poverty	4.75	1.13
Profit	4.63	1.13	To improve soil fertility and increase yields	4.75	0.75	Suitable for local conditions	4.63	2.23
Startup capital	3.25	1.5*	To conserve natural resources	4.9	0.38			

4.12.3 How can we enable priority remediation options to be adopted?

Table 4.13.4 summarises suggestions made by workshop participants to enhance the adoption of remediation strategies that had been prioritised during the workshop.

Table 4.13.4: Suggestions from workshop participants for enhancing the adoption of recommended remediation strategies in Botswana, in rank order

Ways to encourage uptake of technological strategies	Score	Rank
Education, awareness and information dissemination	78	1
Demonstration in the context of development projects	73	2
Financial assistance	52	3
Conservation initiatives (development)	34	4

4.12.4 Feedback from participants

Workshop participants provided the following feedback about the DESIRE project:

- "The DESIRE project has been good. It brought knowledge that we can pass on to younger generations. What remains is for us to teach other people bio-gas and take them to Chaa's house who has kindly opened up her home for this pilot."

- "I say let's move fast and hold awareness campaigns and teach people about the remediation technologies we worked on. It's a pity the Rural Industry innovation Centre (RIIC) is not marketing the technologies. I am now convinced these would. I think there is poor extension service."

- "As a community we should also improve on communication. Not enough people know about the good work of DESIRE and I blame the village leadership. We should improve. Otherwise this has been a good and useful project. This workshop also went very well. As a representative of the youth drama group in the village I promise that we will include the messages of these technologies in our drama scripts to spread the message whenever we are invited to perform."

- "Please show the Government these results so that they can be included in the development proposals especially those targeted at fighting the impacts of desertification."

- "Ms Chaa has agreed to be our 'mirror' on this project and our responsibility is to bring people to learn from this project. We thank the DESIRE team for the support and ask them not to abandon us. You have seen our problems yourselves and our lives."

Figure 4.13.2: Participants discussing remediation strategies during the final DESIRE workshop in Botswana

4.14 Russia (Novy)

4.14.1 Introduction

The Novy study site administratively belongs to the territory of Marksovsky District, which belongs to the Saratov Region (Oblast) of the Russian Federation. Saratov Region is considered as a zone of risky agriculture where cultivation is impossible without irrigation. The predominant original and current land use type is cropland, specifically annual and perennial (non-woody) cropping. Marksovsky district is located in the zone prone to land degradation and which after FAO classification is a zone of very high land degradation.

Soil depletion and soil secondary salinity as well as pollution of local water bodies by nutrients, leading to a decline in agricultural productivity, are the main socio-environmental problems in the area. They are mainly caused by the use furrow irrigation that is inappropriate to local soil and inadequate management of sprinkler irrigation. In response to these challenges, the following remediation strategies were trialled in WB4:

- Drip irrigation of vegetables instead of furrow irrigation; and
- Precision irrigation of forage instead of overhead sprinkler irrigation (which uses excessive amounts of water).

Figure 4.14.1: Furrow irrigation in Marksovsky District, Saratov Region,Russia

4.14.2 Priority Remediation Strategies

Both priority remediating strategies were selected with aim to cope with growing regional problems linked to soil secondary salinization and depletion due to inappropriate to local soil property technologies. Drip irrigation was selected for testing/adaptation at agro farm level promoting minimal irrigation water percolation to groundwater as well as zero discharge to downhill water bodies.

Table 4.14.1: Ranking of remediation options before and after field trials and modelling in Novy, Russia

Rank	Technologies ranked in WB3 workshop	Technologies ranked in WB4-5 workshop
1	Precision irrigation of forage instead of overhead sprinkler irrigation (which uses excessive amounts of water)	Drip irrigation
2	Drip irrigation	Green manure
3	Reducing of the infiltration losses from water supply channels	Drainage of irrigated agricultural fields
4		Phytoreclamation of soil secondary salinity at agricultural fields

4.14.3 How can we enable priority remediation options to be adopted?

After expert discussion about factors that could help promote the use of drip irrigation (replacing furrow irrigation) at agro farm level of Marksovsky District, participants suggested that regional and local administrations should modify financial subsidies.

The development of human resources/capacity and technical infrastructure was deemed important to enable the management of eco-innovative sprinkler irrigation technology at a field level.

4.14.4 Next Steps

The following next steps were agreed:

- Dissemination of final workshop results in local newspaper (October 2011)
- Report on results of final project (October 2011)
- Presentation of DESIRE project results at meeting of Federal level Date (Moscow, November 2011) with aim to promote drip irrigation supporting at household use

4.15 Russia (Dzhanybek)

4.15.1 Introduction

The “Dzhanjbek” study area is situated on the territory of Pallasovsky District, Volgograd Region, and geographically belongs to Elton Lake Province of steppe Zavolzhie, which is classified as desertification province of dry steppe, situated at left bank of lower part of Volga River valley. Three quarters of water resources for irrigation are provided by water supply channels and a quarter by local water sources. The local irrigation system is composed of two systems: i) several hundred kilometers of water supply channels pumping water from Volga River or from its tributaries, ending in artificial ponds; and ii) local water harvesting from melted snow and soil water conservation techniques.

Water resources scarcity is a growing socio-economic & environmental problem in the area, closely linked to spacio-temporal climate variability, change of seasonal patterns of hydrological regime and as consequence land use transformation. Land degradation in the study area focuses around ground water logging, secondary soil salinization and non-uniform irrigated soil properties. To tackle these problems, the following technologies were trialed during WB4:

- Drip irrigation of vegetables instead of furrow irrigation; and
- Precision irrigation of forage instead of “overall” irrigation.

4.15.2 Priority Remediation Strategies

Both priority remediation strategies were selected with the aim of coping with growing regional water scarcity. Drip irrigation was selected for testing/adaptation as unknown at household level technology promoting minimal fresh water to grow vegetables for domestic use and in consequence increase household fresh water availability for livelihood purposes at villages with scarce fresh water resources.

Field trial results showed that drip irrigation is:

- The most water efficient irrigation technology at household level;
- Easily adapted to the regional socio-cultural environment;
- Easily applied at household level with minimal investment, workload and time consuming; and
- Helping to increase household water availability for living and irrigation purposes at villages with scarce fresh water resources.

As such, drip irrigation was the top priority for workshop participants (Table 4.15.1).

Table 4.15.1: Ranking of remediation options before (based on findings from Elton village) and after field trials and modelling in Dzhanjbek, Russia

Rank	Technologies ranked in WB3 workshop	Technologies ranked in WB4-5 workshop
1	Grazing land management by rotation introducing	Drip irrigation
2	Drip irrigation	Impermeability of the bed of water storage capacities
3	Forest, apple tree plantation or shrub belt planting	
4	Contour planting and gully control	

4.15.3 How can we enable priority remediation options to be adopted?

After expert discussion to expand drip irrigation at household level of Pallasovsky District regional and local administrations should advertise it in mass media and encourage its using as a newest technology helping cope with fresh water scarcity at high-tech level with minimal affordable investment, and at the same time allowing enrich by vitamins traditional meat-based family diet.

4.15.4 Next steps

The following next steps were agreed:

- Workshop results in local newspaper (October 2011)
- Report on results of final project (October 2011)
- Presentation of DESIRE project results at meeting of Federal level Date (Moscow, November 2011) with aim to promote drip irrigation supporting at household level use

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Appendix 1

1. Workshop Format

Duration: Local stakeholder workshops will take one day

Summary: The workshops will combine presentations of results with participatory methods to engage participants in evaluating trial results and model outputs, and formulating recommendations for policy and practice. As such, they represent an opportunity to both disseminate findings and collect new information on model output evaluation and policy recommendations. The workshop will focus on:

- Sharing and evaluating results from WB4 trials of remediation options that were prioritised during the previous WB3 workshop
- Sharing and evaluating results from WB5 models which show how the remediation options can be applied throughout the local area, taking into account the physical limitations and socio-economic assessment criteria
- Selecting and/or prioritising remediation options for wider dissemination/application and making lists of recommendations relevant to stakeholders at local, up to national scales, that can facilitate their widespread adoption

Checklist:

The following inputs and materials need to be prepared before the workshop can be conducted:

1. Presentation of the DESIRE project
2. Presentation of WB4 trial results
3. Presentation of WB5 model outputs
4. Overview of criteria used in WB3
5. Computer(s) with Facilitator software installed
6. Flip-chart, tape, markers (overhead projector pens), post-it notes, sticky dots

Structure during the day [with indicative timing of elements between brackets]:

1. **Brief presentation to introduce the DESIRE project [09:30]** (there may be new participants present and for those who have engaged with the project previously, a re-cap will be useful context): this should include a general overview of the project, a summary of results from WB1-WB3, focussing in particular on a) the state of land degradation and conservation efforts in the study area (WB1); b) assessment of land degradation according to indicators (WB2); and c) the reasons why remediation options were chosen for trial (explaining the criteria that were chosen by WB3 workshop participants and the results of the multi-criteria evaluation that was done then)
2. **Presentation of WB4 trial results [09:45]** (presentation to be compiled in advance by study site teams) Either: a) study site teams include a pre-evaluation based on stakeholder opinion of

those engaged in monitoring; or b) allow time for stakeholders who were involved in monitoring to express their experience and opinions.

3. **Presentation of WB5 model outputs [10:05]** showing which remediation options are most applicable and most likely to be adopted where, across each study site. These will be pre-prepared as Powerpoint slides by the WB5 team (which can be printed as posters where projection equipment is not available). Model outputs will include analyses of feasibility vs. spatial assessment of desertification risk (WB2). Furthermore, rather than a one-size-fits-all approach, outputs will be focussed according to priorities expressed by stakeholders in their selection of criteria for Multi-Criteria Evaluation in WB3 (e.g. showing which remediation options would be most likely to be adopted by the poorest in the community (e.g. with no need for up-front costs) in Botswana where poverty alleviation was an important criteria expressed in WB3, rather than focussing on which options would most likely maximise farmer profits, as prioritised in other sites like Spain)
4. **Workshop: Multi-criteria evaluation of remediation options at study site scale [10:20]**
    a. Revisit criteria used in WB3 – do we need to add new criteria (or drop certain criteria that are no longer deemed relevant) in light of what's been learned so far today, and to ensure we can evaluate remediation options at a study site scale? For example, there may be criteria used in the model and presented in maps in the previous presentation that were not considered during WB3, which participants may want to include in the decision-making process [25 min].
    b. In light of WB4 and 5 findings, do a Multi-criteria evaluation using revised criteria, to prioritise which remediation options (tested in WB4 and/or modelled in WB5) are most relevant for dissemination across the study site:
        i. Using the Facilitator software (used in WB3 workshops – see WB3 training manual for instructions), enter relevant criteria and remediation options. In sites where only one option has been trialled and/or modelled, this should still be done, as a structured way of enabling everyone to evaluate the benefits/drawbacks of the technology. For study sites with a larger number of technologies to consider, it could be worthwhile splitting the stakeholder group to make separate evaluations along such lines as arable crops vs. tree crops, flatland vs. sloping land, livestock vs. cropping, etc. – whichever is a major distinction locally affecting applicability of selected technologies. Splitting the group is not advisable if this leads to low numbers of participants [45 min].
        ii. Participants evaluate each option by each criterion individually, and group results are displayed, ranking the most popular remediation options and showing why these were deemed most relevant for dissemination (see instructions in WB3 manual for details of how to do this) [45 min] – inputting scores and deriving results from the facilitator software may take some time, so you may need to break for lunch at this point, and discuss the outputs (next step) immediately after lunch
        iii. [This may need to be done immediately after lunch] Discuss the ranked list that emerges from the Facilitator software. Should all remediation options be

disseminated, prioritising certain options? Or should some options not be further disseminated (the cut off point at which options are dropped can only be decided through discussion). Or should certain options that appear to be ranked lower than others only be promoted to certain groups in certain areas? This will result in a list of priority remediation options that excludes any options deemed inappropriate for further dissemination [45 min].

Note that two specific situations may occur (a flowchart decision aid tool is available to verify these):

- In some study sites, multiple (or all!) trialled remediation options may be prioritised for dissemination – in this case, the important information from this analysis is understanding why different options have been prioritised, so that this can inform the development of strategies to promote these options (see step 5 below).
- If none of the remediation options that were trialled and modelled are deemed appropriate for dissemination, the following workshop (step 5) should be replaced by a session which focuses instead on the reasons why they were not deemed appropriate, in order to: i) identify ways that remediation options could be adapted to make them more acceptable/effective; and/or ii) identify alternative remediation options that are less likely to have the problems associated with the options that were trialled and modelled. Potentially, stakeholders are not convinced by scientific results (e.g. trials of insufficient length) – this is another direction that the discussion might take.

5. **Workshop: how could we facilitate the adoption of the priority remediation options that have emerged at the study site scale? [14:00]** This may be done very simply using a "meta-plan" followed by a "sticky dot prioritisation" (in study sites where people are largely illiterate or don't feel comfortable writing other techniques may be substituted for this – see Section 5 below). An important element of the technique proposed here is to ensure that all participants have their say in a transparent and fair way, and to enable this to happen in a limited amount of time (just discussing this question will take much longer, and may lead to dominant characters biasing results):
    a. Stick at least 4 sheets of flip-chart paper together on the wall (use more if you have a large group to provide plenty of room), and write the question you want people to answer at the top of the paper e.g. "How could we facilitate the adoption of the priority remediation options we've identified?" (ideally in less technical language!). Note that facilitating adoption is about taking advantage of opportunities, i.e. eliminating threats. Hence this workshop will give important information on the constraints and opportunities perceived by stakeholders [10 min]
    b. Give all participants 3-5 post-it notes (for small groups 10-15, give people 4 or 5 each, but if group is over 20, only give out 3 each)

c. Give all participants an Over Head Projector (OHP) pen (something that's bold enough to be seen from a distance, but fine enough to enable people to write something meaningful in such a small space)
d. Ask participants to answer the question on the wall, including only one point per post-it in as few words as possible, making their writing large enough to be read from a distance. They can write up to the maximum number of post-its you gave them (3-5 post-its) but don't have to fill all their post-its [15 min]
e. As people finish writing their points, ask them to come and stick them on the wall, putting different points in different places, first looking at what else has been written, and putting their points next to points that are similar. Emphasise that people can discuss with each other as they come to the wall, and can move each other's points around if they want [30 min]
f. Go through each of the groups of post-its that emerge in turn, suggesting what theme the post-its represent (e.g. "all these post-its are talking about different ways of subsidising remediation options"), reading out a sample of the post-its in the group, and checking if the group agrees with the way you've summarised the points. Be prepared to split the group up or put it with another group of post-its, if participants think this is necessary. Then circle each group of post-its in turn, writing in large letters the title/theme of the group. The themes thus evolved together constitute the "meta-plan" [20 min]
g. Finally, give everyone 10 sticky dots (available from any stationer – or just tell people to put crosses next to each idea but warn them to keep count and not use more than 10 crosses) – it is important that everyone has the same number of dots. Ask them to stick their dots next to the groups of ideas they like best (for whatever reason) – they can stick as many as they like next to any point (if they only think there's one good idea, they can put all 10 next to one group of post-its). This final part of the exercise can potentially be done over a coffee break [20 min]
h. Count up the sticky dots (or crosses) and rank the ideas [10 min]
i. If there is time, you can then facilitate a discussion about the advantages and disadvantages, and practical steps that can be taken for the top ranked ideas, to make them happen in practice [45 min]

6. **Workshop evaluation [16:30]:** Take a moment to evaluate the workshop in order to get feedback on the process used and the participants' opinion on the importance of the project's results.
    a. Evaluation of the role scientific results from the project have played to arrive at individual evaluations by stakeholders on each criterion (step 4b – ii). Write each criterion on top of a sheet of flip-chart paper. Draw a table with three rows below it and write respectively 'no', 'little' and 'much' in them. Ask the participants to walk around and put one sticky dot (or cross) per sheet to characterise how much the scientific results from the project have influenced their evaluation of the remediation options.

b. Facilitate a round of open comments on what people thought about the workshop and the rest of the DESIRE process over the last 4 years (all WBs). The comments/remarks may generate a rich qualitative feedback (nice quotes).

7. **Next steps [16:50]**: Before finishing the workshop, explain what the next steps will be – at minimum, this will involve them all receiving a workshop report specifically targeted to local stakeholders. This should include contact details for participants (with their permission) or external parties that can be contacted by people requiring advice on how to adopt/implement any of the technologies discussed. A number of other actions are likely to have emerged during the workshop, which should be documented, and people should be assigned to these actions with deadlines. One of these actions should be a clear dissemination (product) of the most promising strategies; when we want the most promising strategie(s) to be implemented and the word spread around in the area, clear guidelines should be issued on how to implement measures and how to manage implemented measures. This could be done in the form of a brochure in the language for farmers. We must prevent that the stakeholders (especially farmers) involved, having invested a lot of their precious time, end up with the feeling: 'and now what?'. Farmers and landowners are the most important group here, in the sense they are the people who have to implement strategies on their land. They should get the feeling that an optimized end product has been produced, that can really be used in practice.

2. Interview format

Duration: count on a minimum of two hours

Summary: the interviews with at least three representative district and national level members of the policy community, will focus on:

- Sharing and evaluating the results of the local stakeholder workshop (above)
- Sharing and evaluating WB5 model outputs showing the likely effects of a range of policy scenarios (this may be done before the results of the first session are shared, if this is deemed a more logical order by study sites)
- Discussing how priority remediation options could be disseminated and promoted at district and/or national scales, using WB5 policy scenarios as a starting point

Checklist:

- **Schedule an individual meeting with at least three different key policy stakeholders:** identify the key policy stakeholders from the stakeholder analysis (after having received feedback from the WB5 coordination team). If appropriate, ask them to organize a lunch-time seminar internal to their institution in which you will present the findings from the local stakeholder workshop and policy scenarios, including an interactive discussion element.

- **Pre-workshop stakeholder information**: time available during an interview is likely to be limited. A folder with brief information about the DESIRE project, the context of the interview and results of the local stakeholder workshop could be sent out together with the invitation to participate in an interview, serving both to raise interest and to inform participants beforehand.
- **Presentation of results from the local stakeholder workshop and WB5 policy scenarios:** a brief presentation introducing the framework within which the local stakeholder workshop was operated and what conclusions were drawn, and the regional effects of policy scenarios, prioritised where possible in relation to information from WB1.

Structure of the interview:

1. **Brief presentation of the results of the local stakeholder workshop and WB5 policy scenarios [30 min]**. The presentation should finish with the results from step 5 of the Workshop format: a preferred list of strategies to facilitate adoption of prioritised remediation technologies.
2. **Allow questions and discussion [15 min]**, to be recorded and differences of opinion noted. Keep this reasonably short, as you want to get structured views of policy makers on what they suggest should be the strategy (d)
3. **Ask the question: "How could we facilitate the adoption of the priority remediation options from the previous session at a study site and up to a national scale?" [5 min]** Revisit the preferred list of strategies from the local stakeholder workshop and WB5 policy scenarios simulating their regional effects, and invite the audience (individual or group) to add elements as the audience represents the same stakeholder, equal individual presentation is not an issue but if differences of opinion exist between them this should be recorded)
4. **Ask the audience to distribute 10 points over the list of suggested strategies [10 min]**
5. **Follow up with discussion [45 min]** what the advantages and disadvantages are of the top-ranked ideas, and what policy actions need to be taken, how feasible that is, and what their role is in ensuring long-term adoption of the research results (cf. Workshop format, 5i)
6. **Next steps [15 min]:** Before finishing the meeting, explain what the next steps will be – at minimum, this will involve your promise to send your host a policy brief after you have taken into account the comments of various policy level stakeholders. A number of other actions are likely to have emerged during the meeting, which should be documented, and people should be assigned to these actions with deadlines.

3. Alternative set-ups for the Local Stakeholder Workshop

The following is a list of considerations for which a Flowchart is available to aid planning the workshop. Two phases are distinguished: i) considerations while preparing the workshop; and ii) considerations emerging during the workshop. The Flowchart itself is a digital attachment to this guide (Powerpoint file); Appendix C includes a form to keep track of Flowchart recommendations for planning.

Considerations while preparing the workshop:

Size of the study site:

- Some study sites may be too large for local stakeholders (or an important group of local stakeholders such as individual farmers) to have an overview of the suitability of different remediation options across the area. Where this is the case, special attention needs to be paid to geographical representation of stakeholders, i.e. to make sure that the participants as a whole are informed about the total area. A section of the flowchart will address this issue.

The flowchart will also guide study sites through questions determining whether the workshop format of step 4 and 5 is culturally or practically appropriate. So far the following alternative set-ups will be supported:

- If (some) stakeholders are illiterate; take care to select a good facilitator who can express things clearly and who is sensitive to the information needs of (some) stakeholders. A pre-assessment of remediation options by study site teams with a few stakeholders (e.g. those involved in monitoring) might serve to identify the themes likely to evolve from step 5e and visual aids may be developed prior to the workshop to support stakeholder comprehension. If less than half of the participants are expected to be illiterate (and if it is not embarrassing for individuals), writing up of comments can be done in pairs, or moderated by the facilitator (in this case it is important to give equal attention to all participants). Also go through the other flowcharts to identify if any of the other issues apply to your site.
- If it is culturally not acceptable to express individual thoughts in written form, or if in the local culture discussion prevails over the suggested workshop format; a good facilitator is needed who can collect all points (paying equal attention to all) and then prepares the themes of step 5e for sticky dot voting.
- If certain stakeholders have difficulties expressing themselves plenary (e.g. women do not speak out in front of men), the facilitator has a decisive role to play! Let (preferably) groups of people (according to type of stakeholder) raise their points, the facilitator first just collects all the ideas (post-its; which in some cases might need reformulation), and then groups the different points (aggregating those belonging together etc) in a plenary discussion (step 5e-f). It will be important to point out where different stakeholders agree, but also where there is disagreement, inconsistencies, contradictions etc.
- If sticky dot voting is not well adapted to the local customs; alternative systems which are familiar to stakeholders can be adopted (e.g. scoring using beans as was mentioned for Botswana)
- If open sticky dot voting could be problematic for (some) stakeholders; creative alternatives should be plenty, e.g. handing out 10 flat paper fiches to be deposited in closed boxes representing the various options by each participant, or a A4 paper with the options listed in table form with boxes to write any combination of numbers summing up to 10 privately (and to be deposited anonymously in a box if required).

Considerations arising during the workshop:

- Most of the issues that might arise during the workshop should, based on your knowledge of the area and experience in conducting WB3 workshops, be possible to consider while preparing the workshop. However, should you unexpectedly be confronted with any problems as sketched above on the day itself, re-run through the flowchart to change strategy real-time.
- One consideration you cannot plan ahead is what to do when multiple or none of the remediation technologies are evaluated favourably. The flowchart will suggest to focus the discussion following evaluation accordingly, and to replace step 5 with an alternative session if none of the technologies is recommended.