Prevention and Restoration Actions to Combat Desertification. An Integrated Assessment. PRACTICE Project

Leopoldo Rojo. Ministry of Environment
Susana Bautista. University of Alicante
Ramón Vallejo.

CEAM: Centro de Estudios Medioambientales del Mediterraneo

http://www.ceam.es/practice
The problem

• Large investments to restore drylands and combat desertification

But

• Little monitoring of practices to combat desertification

⇒ Limited project evaluation, exchange of experiences and knowledge

⇒ Compromising the adoption of best available practices
PRACTICE GENERAL OBJECTIVE

To develop and apply evaluation tools to assess the effectiveness of prevention and restoration practices in areas affected by desertification, covering a large diversity of socioeconomic and biophysical conditions worldwide.
What is PRACTICE about?

**Actions** to combat desertification

**Evaluation** of actions

**Participatory** assessment

**Adoption** of good practices

**Knowledge exchange and social learning**
**LTEM sites:** 17 sites in 12 countries.

Mediterranean Europe (Greece, Italy, Spain, and Portugal), Africa (Morocco, Namibia, South Africa), Middle East (Israel), China, and South, and North America (Chile, Mexico, and USA)
PRACTICE Protocol: Linking evaluation and knowledge exchange to combat desertification
A Framework for Evaluation of Actions and Indicator Selection

Actions to combat land degradation

Key common indicators
Scientists

Biophysical data

Participatory and Integrated Evaluation

Site-specific indicators
Stakeholders

Knowledge exchange

Improved actions
Increased adoption

Socio-economic data
A Framework for Indicator Selection

Table 1.1. Key Dryland Ecosystem Services (C22.2)

<table>
<thead>
<tr>
<th>Provisioning Services</th>
<th>Regulating Services</th>
<th>Cultural Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goods produced or provided by ecosystems</td>
<td>Benefits obtained from regulation of ecosystem processes</td>
<td>Nonmaterial benefits obtained from ecosystems</td>
</tr>
<tr>
<td>■ provisions derived from biological productivity: food, fiber, forage, fuelwood, and biochemicals</td>
<td>■ water purification and regulation</td>
<td>■ recreation and tourism</td>
</tr>
<tr>
<td>■ fresh water</td>
<td>■ pollination and seed dispersal</td>
<td>■ cultural identity and diversity</td>
</tr>
<tr>
<td></td>
<td>■ climate regulation (local through vegetation cover and global through carbon sequestration)</td>
<td>■ cultural landscapes and heritage values</td>
</tr>
<tr>
<td></td>
<td></td>
<td>■ indigenous knowledge systems</td>
</tr>
<tr>
<td></td>
<td></td>
<td>■ spiritual, aesthetic, and inspirational services</td>
</tr>
</tbody>
</table>

Supporting Services
Services that maintain the conditions for life on Earth

<table>
<thead>
<tr>
<th>Soil development (conservation, formation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary production</td>
</tr>
<tr>
<td>Nutrient cycling</td>
</tr>
</tbody>
</table>

MA Framework

- Consistency with Ecosystem Services Approach
- Focus on human well-being
- Consistency with UNCCD (CST- Impact Indicators), CBD, and UNFCCC recommendations
## Criteria

<table>
<thead>
<tr>
<th>Provisioning Services</th>
<th>Regulating &amp; Supporting Services</th>
<th>Cultural Services</th>
<th>Economy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goods (food, fiber, timber, fuel wood...)</td>
<td>Water and soil conservation</td>
<td>Landscape and cultural heritage</td>
<td>Income, personal wealth</td>
</tr>
<tr>
<td>Productivity</td>
<td>C sequestration</td>
<td>Site-specific</td>
<td>Site-specific</td>
</tr>
<tr>
<td>Productivity value</td>
<td>SOC Above-ground biomass</td>
<td>Diversity of vascular plants</td>
<td></td>
</tr>
</tbody>
</table>

### Indicators / Proxies

- Plant cover & pattern
- Soil surface condition
- SOC
- Above-ground biomass
- Site-specific

---

CSFD Séminaire Montpellier 29-30 juin 2011
**Soil surface condition** (In particular, bare-soil surface condition)

Potential for water regulation through infiltration
Potential for nutrient cycling

Estimated from a set of soil surface features (semiquantitative assessment):
Water and soil conservation

Proxies / metrics → Bare-soil connectivity

Plant cover and pattern

↓ connectivity
runoff and erosion

↓ connectivity
runoff and erosion
C sequestration

Proxies / metrics

Soil Organic Carbon

Above-ground biomass → Above-ground plant volume/biomass

Plant cover x plant height → volume
Validation through biomass sampling (per main functional group)
Biodiversity

- Proxies / metrics

**Biodiversity of vascular plants** → Composition and species abundance of vascular plants

- Species richness
- Diversity and Evenness indices
- Abundance of selected key species
  - Including: Invasive alien species
  - Threatened species

This does not preclude the use of other metrics of site-specific interest.

Any data available is useful, but should be consistently measured for every action considered for evaluation in each site.
MSP Identification & Engagement

Baseline Action evaluation & Indicator selection

Initial Evaluation of Actions

Local Indicators (site specific)

Weighting Indicators

Indicator Weights

Data set

Integrated Evaluation MCDA nalysis

Dissemination

Participatory process

Social learning

MSP (Multistakeholder platform)

Common Indicators

Science
The example of AGOST site

VENTÓS catchment (1600 ha)
Land use and activities

**Past**
- Agriculture and wood gathering
- Alpha-grass fiber exploitation

**Present**
- Vineyard
- Clay industry (mining, pottery, construction)
- Recreation – hunting
5 different actions in Ventos catchment:

- NO action. Alpha-grass steppe without reforestation, S-facing slopes.
- Aleppo pine plantation (50s-60s), N-facing slopes
- Aleppo pine plantation (70s-90s), S-facing slopes
- Recharge dam
- Dams on creeks and gullies
CEAM and University of Alicante team proposed a:

**Initial list of Potential Stakeholders (PSH)**

**Identification of Categories**

- **37** Names of Potential Stakeholders

- **9** PSH from the initial list

- **14** new PSH = chain referral

- **6** PSH from chain referral

**14 Stakeholders**

Stakeholder platform engagement process
### Step 1: Stakeholder identification

#### Stakeholder platform composition

<table>
<thead>
<tr>
<th>Category Subcategory</th>
<th>Stakeholders involved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gov. Administrations: Elected Officials</td>
<td>Agost Major</td>
</tr>
<tr>
<td>Gov. Administrations: Civil Servents with Knowledge</td>
<td>Current environmental coordinator</td>
</tr>
<tr>
<td>Governamental Agency Experts: Forestry</td>
<td>Department of Environment</td>
</tr>
<tr>
<td>Associations: Recreation</td>
<td>Hunting Association</td>
</tr>
<tr>
<td>Associations: Cultural</td>
<td>Miren per Agost</td>
</tr>
<tr>
<td>Environmental NGOs</td>
<td>Ecologistas en Acción</td>
</tr>
<tr>
<td>Educators</td>
<td>Agost High school</td>
</tr>
<tr>
<td>Other People with Special Local Knowledge</td>
<td>Past Environmental Coordinator</td>
</tr>
<tr>
<td>Local Industries</td>
<td>Pottery Industry owner</td>
</tr>
</tbody>
</table>
Overall opinion on the actions

Do you think this action has been a good choice? On a scale of 1 to 5, where 1 is “very bad choice” and 5 is “excellent choice,” how would you rate this action?

- **Reforestation N-facing**: 4
- **Reforestation S-facing**: 2.9
- **Alpha grass**: 3.8
- **Dam**: 4.3
- **Recharge Dam**: 3.8

The graph shows the distribution of responses for each action.
## Positive and negative outcomes

### “Very good action”

**Dam on creeks**

<table>
<thead>
<tr>
<th>Positive</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avoid floods</td>
<td>Visual impacts (Not integrated with the landscape)</td>
</tr>
<tr>
<td>Labor</td>
<td></td>
</tr>
<tr>
<td>Avoid soil erosion</td>
<td></td>
</tr>
<tr>
<td>Recharge of the aquifer</td>
<td></td>
</tr>
<tr>
<td>No negative outcomes</td>
<td></td>
</tr>
</tbody>
</table>

### “Moderate action”

**Forestation on the south slope**

<table>
<thead>
<tr>
<th>Positive</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stop erosion</td>
<td>Lack of plant diversity (monospecific)</td>
</tr>
<tr>
<td>Sequestration of CO₂</td>
<td>Increase erosion (machine for subsoiling)</td>
</tr>
<tr>
<td>Avoids loosing organic matter of soil</td>
<td></td>
</tr>
<tr>
<td>Risk of fire</td>
<td>Destroy aquifer</td>
</tr>
</tbody>
</table>
### Step 3: Dataset collection

#### Landscape Unit Data Base

<table>
<thead>
<tr>
<th>Categorías del MEA&lt;sup&gt;1)&lt;/sup&gt;</th>
<th>Criterio</th>
<th>Indicador</th>
<th>Unidades</th>
<th>Repoblación vieja</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Servicios de soporte</strong></td>
<td>Contenido de materia orgánica edáfica</td>
<td>Carbono orgánico</td>
<td>%</td>
<td>2,00:</td>
</tr>
<tr>
<td><strong>Servicios de regulación</strong></td>
<td>Producción de sedimentos</td>
<td>Tasa de erosión</td>
<td>kg m&lt;sup&gt;-2&lt;/sup&gt; año&lt;sup&gt;-1&lt;/sup&gt;</td>
<td>0,005</td>
</tr>
<tr>
<td></td>
<td>Regulación climática</td>
<td>Volumen de fitomasa</td>
<td>m&lt;sup&gt;3&lt;/sup&gt; m&lt;sup&gt;-2&lt;/sup&gt;</td>
<td>4,85</td>
</tr>
<tr>
<td><strong>Biodiversidad</strong></td>
<td>Riqueza específica (plantas vasculares)</td>
<td>Número total de especies de plantas, por inventario</td>
<td>N</td>
<td>34</td>
</tr>
<tr>
<td></td>
<td>Plantas endémicas, raras, amenazadas</td>
<td>Número de especies de plantas endémicas, raras o amenazadas, por inventario</td>
<td>N</td>
<td>4,0</td>
</tr>
<tr>
<td></td>
<td>Especies de interés cinégético</td>
<td>Preferencia de hábitat para fauna cinégética</td>
<td>UR</td>
<td>+</td>
</tr>
<tr>
<td><strong>Servicios de provisión</strong></td>
<td>Acumulación de biomasa</td>
<td>Biomasa total</td>
<td>kg ha&lt;sup&gt;-1&lt;/sup&gt;</td>
<td>9473</td>
</tr>
<tr>
<td></td>
<td>Producción forrajera</td>
<td>Producción forrajera</td>
<td>UF ha&lt;sup&gt;-1&lt;/sup&gt; año&lt;sup&gt;-1&lt;/sup&gt;</td>
<td>253</td>
</tr>
<tr>
<td></td>
<td>.Productos forestales no maderables</td>
<td>Abundancia de especies de plantas con interés artesanal y alimentario, por inventario</td>
<td>%</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Plantas aromáticas y medicinales</td>
<td>Abundancia de especies de plantas aromáticas y medicinales, por inventario</td>
<td>%</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Producción de agua dulce</td>
<td>Agua retenida</td>
<td>%</td>
<td>11</td>
</tr>
<tr>
<td><strong>Servicios culturales</strong></td>
<td>Atractivo paisajístico</td>
<td>Valor estético</td>
<td>UR</td>
<td>5,8</td>
</tr>
<tr>
<td></td>
<td>Relevancia en la cultura tradicional</td>
<td>Valor cultural</td>
<td>UR</td>
<td>4,4</td>
</tr>
<tr>
<td><strong>Beneficios económicos</strong></td>
<td>Ingresos de cultivos</td>
<td>Ingresos por comercialización de cultivos en origen</td>
<td>€ ha&lt;sup&gt;-1&lt;/sup&gt; año&lt;sup&gt;-1&lt;/sup&gt;</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Empleo</td>
<td>Demanda de mano de obra</td>
<td>Jornales ha&lt;sup&gt;-1&lt;/sup&gt; año&lt;sup&gt;-1&lt;/sup&gt;</td>
<td>0,7</td>
</tr>
</tbody>
</table>
Step 3: Dataset collection

Soil Organic Matter 0-20 cm

Landscape Units

- Repoblación
- Matorral
- Espartal
- Pastizal
- Campos abandonados
- Cultivo secano
- Cultivo regadío

Soil Organic Carbon (%)
LTEM sites: 17 sites in 12 countries.
Mediterranean Europe (Greece, Italy, Spain, and Portugal),
Africa (Morocco, Namibia, South Africa), Middle East (Israel), China, and
South, and North America (Chile, Mexico, and USA)
LANDSCAPE RESTORATION

Albatera site – Alicante, Spain
PINE REFORESTATION

Agost site – Alicante, Spain
FIRE MANAGEMENT

Ayora site – Valencia, Spain

VEGETATION MAP

FUEL MODEL

1984 Landsat image

CEAM
PSEUDO-STEPPE HABITAT CONSERVATION

SUSTAINABLE AGRICULTURE

Castro Verde site – Alentejo (Portugal)

LPN - Liga para a Protecção da Natureza (Portugal)
RANGELAND IMPROVEMENT

LAGADAS SITE - THESSALONIKI
FOREST MANAGEMENT

Pixinamanna site – Sardinia, Italy

NRD-Università di Sassari & Ente Foreste della Sardegna
INCREASING FODDER PRODUCTION

Fodder shrub plantation interventions
(STATE; since 90s)

Ouled Dlim site (Morocco)

NRD-Università di Sassari & DPA- Direction Provinciale de l’Agriculture Marrakech
Evaluate restoration technologies in the “dune veld”
Dune stabilization plots started in 1997

Kalahari

Grazing Management

Molopo site

Klaus Kellner
School of Environmental Sciences and Development
North West University
(Potchefstroom campus)
South Africa
Desertification Processes and Rehabilitation Efforts in the Negev

K.K.L & LTER

BEN GURION UNIVERSITY OF THE NEGEV ISRAEL
RESTORATION OF PASTURES

Changling/ Wulanaodu sites (Jilin/Inner Mongolia)

Location 43°51' N, 125°19' E, semi-arid climate

Restoration technique
Restore vegetation and soil from alkalized meadow steppes

NORTHEAST NORMAL UNIVERSITY

Institute of Grassland Science
Deli Wang
WATERSHED MANAGEMENT

GRAZING MANAGEMENT

El Sauce site

COQUIMBO, CHILE

Las Cañas site

Instituto de Ecología y Biodiversidad (IEB) – Universidad de la Serena
CSFD Séminaire Montpellier 29-30 juin 2011

Two LTEM sites:

- Chihuahua
  Improving grasslands for grazing purposes
- El Tokio
  Preserving and/or restoring habitat for endangered wildlife

Chihuahua rangelands

El Tokio grassland

Universidad Autónoma de Nuevo León (México)
UANL
SOIL EROSION CONTROL

San Simón watershed, Arizona, USA
PRACTICE potential on evaluation of policies, plans and projects

- Not fully developed nor tested. Completion and testing in course
- Refined protocol and strategies for implementation within national and regional plans to combat desertification.
- Complement conventional project evaluations with subjective participatory users point of view. Unccd asks participatory/bottom-up approaches

- From assessment to design of environmentally sound and socially integrated projects and plans. Effective public information of projects
Merci beaucoup pour votre attention!