Use of rainwater harvesting for alleviating poverty in rural areas

ACSAD Experience in the Arab Region

UNESCO G-Wadi Meeting on Water Harvesting
Aleppo - Syria
20 - 22 November 2006
Outline of the Presentation:

- Natural features of the Arab region.
- ACSAD activities for supporting rural water sector.
  - Improving livelihood of poor rural community in mountainous area.
    - Case studies - Syria
    - Case study - Yemen
  - Watershed management in mountainous terrains
ANNUAL average rainfall total (mm)
by FAO - SDRN - Agrometeorology Group - 1997
Rainfall Distribution in The Arab Region

Legend

<table>
<thead>
<tr>
<th>Area (%)</th>
<th>Qty (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 100</td>
<td>52.0</td>
</tr>
<tr>
<td>100 - 200</td>
<td>22.0</td>
</tr>
<tr>
<td>200 - 300</td>
<td>8.0</td>
</tr>
<tr>
<td>300 - 500</td>
<td>7.0</td>
</tr>
<tr>
<td>500 - 800</td>
<td>5.5</td>
</tr>
<tr>
<td>More than 800</td>
<td>5.5</td>
</tr>
</tbody>
</table>

Transverse Mercator Projection
Longitude 15° 00'

For areas and quantities calculation, Albers equal area Projection was used
Standard Parallels 7° 40' N and 38° 20' N
Frequent drought events occur in the region. Precipitation of Cyprus over the past century (Ragab 2005). 

Number of tropical days (max. temperatures over 30 °C) in Zajecar (source: Dragovic and Maksimovic, 2002)
Precipitation was, in most areas, *reduced by up to 70 percent*. The reduced rainfall was also accompanied by increases in minimum ambient temperatures which increased evapo-transpiration.

*Rainfall from October 1998 to April 1999 compared to Average*
Freshwater availability is falling to crisis levels:
ACSAD activities for supporting Rural Water Sector
I - Improving livelihood of poor rural community in Mountainous Area

1- Case study from Syria

- The mountainous coastal area in Syria is characterized by high rainfall in winter time (average is 1000 mm), but due to geological condition the region is suffering from acute shortage of water during summer season, mainly in agriculture sector which is the main source of income for the rural communities.
Major characteristics of the area

- Degradation of the vegetation cover due to over cutting and overgrazing.
- Inappropriate agricultural practices,
- Water shortage during summer season.
- Main cultivated crops are wheat and tobacco
- Poverty
Btamosh Case study from Syria

- The mountainous coastal area in Syria is characterized by high rainfall in winter time (average is 1000mm), but due to geological condition the region is suffering from acute shortage of water during summer season, mainly in agriculture sector which is the main source of income for the rural communities.
The main wadi and terraces rehabilitated by the local community for cultivation
Outcropping of fissured limestone
overgrazing

over cutting
Poverty
ACSAD interventions

• Provide water resources for supplementary irrigation and domestic use

• Introducing new variety of wheat (frost resistance, early maturing, and high production)

• Introducing new crop (fruit trees, medical plants)
حدود الحوض الساكن والمسيلات المائية في موقع الدراسة
# Rainfall data

**Kadmous station**

<table>
<thead>
<tr>
<th>Precipitation in mm</th>
<th>Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>788</td>
<td>2004-2005</td>
</tr>
<tr>
<td>1288</td>
<td>2002-2003</td>
</tr>
<tr>
<td>1488.5</td>
<td>2001-2002</td>
</tr>
<tr>
<td>996</td>
<td>2000-2001</td>
</tr>
<tr>
<td>1103</td>
<td>1999-2000</td>
</tr>
<tr>
<td>1001</td>
<td>1998-1999</td>
</tr>
<tr>
<td>1256.5</td>
<td>1997-1998</td>
</tr>
<tr>
<td>1044</td>
<td>1996-1997</td>
</tr>
<tr>
<td>1078</td>
<td>1995-1996</td>
</tr>
<tr>
<td>1156.9</td>
<td>المتوسط</td>
</tr>
</tbody>
</table>
Location of the lake site
The hill reservoir was constructed with participation of local people.
Building a hill reservoir

- A hill reservoir were constructed with storage capacity of 7000 m³. 1000 micron LDPE sheets were used for lining.
- The water from the reservoir will be used for supplementary irrigation and domestic use.
The Hill reservoir
Water was pumped through 1100 m long polyethylene pipeline to the villager cisterns.
Water is mainly used to irrigate tobacco crop. It is expected that the yield will be doubled due to supplementary irrigation.
Introducing new varieties of wheat

- six varieties of wheat were evaluated in the project area
Major advantage of ACSAD varieties is early maturing
<table>
<thead>
<tr>
<th>Variety</th>
<th>Production ton/ ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACSAD 1105</td>
<td>4</td>
</tr>
<tr>
<td>ACSAD 1129</td>
<td>3.9</td>
</tr>
<tr>
<td>ACSAD 1229, ACSAD 1107, ACSAD 1103</td>
<td>3.25</td>
</tr>
<tr>
<td>LOCAL</td>
<td>2</td>
</tr>
</tbody>
</table>
2-New rainwater harvesting project in the coastal area of Syria, Al Shiha village.

- Al-Shihah village is located in a mountainous area approximately 45 KM west of the city of Hama - Syria at elevation of 1030 m above mean sea level. Average annual rainfall in the area is 1157 mm. Three locations were selected to construct excavated ponds in Al-Shihah village. The locations were selected that pond will collect water from hillside and that farmers can irrigate their tobacco fields by gravity with minimum piping. Each pond will be 50 × 50 × 3m with side slope of 2:1 and store volume of 7000 m³. After exaction the soil will be lined with stones to protect soil from erosion.
Overview on the terraces which will be irrigated
Overview on the terraces which will be irrigated
Overview general on the terraces
The location of the site for the hill reservoir
Rainfall data from Kadmos weather Station

<table>
<thead>
<tr>
<th>year</th>
<th>Rainfall (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004-2005</td>
<td>788</td>
</tr>
<tr>
<td>2002-2003</td>
<td>1288</td>
</tr>
<tr>
<td>2001-2002</td>
<td>1488.5</td>
</tr>
<tr>
<td>2000-2001</td>
<td>996</td>
</tr>
<tr>
<td>1999-2000</td>
<td>1103</td>
</tr>
<tr>
<td>1998-1999</td>
<td>1001</td>
</tr>
<tr>
<td>1997-1998</td>
<td>1256.5</td>
</tr>
<tr>
<td>1996-1997</td>
<td>1044</td>
</tr>
<tr>
<td>1995-1996</td>
<td>1078</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>1156.9</strong></td>
</tr>
</tbody>
</table>
Improving livelihood of poor rural community in Mountainous Area

III - Case study from Yemen
The Pilot area in Yemen, For Sub-regional Action Program in West Asian Countries (SRAP) UNCCD-

- The project site is located in the Al-Ramaa area in Yemen about 80 km from Lahaj governorate. In general the project area suffer from the following problems:
  - collapsing of terrace systems,
  - degradation of vegetation cover due to over cutting of timber,
  - water scarcity, and
  - inappropriate agricultural practices
Providing drinking water by collecting rainwater in Al-Ramaa area in Yemen
Water scarcity

Women bring water from six kilometer far distance
Water scarcity
• A 115-m³ storage tank for rainwater harvesting from the polyclinic roof were constructed. The tank was constructed by participation of local communities.
Participating of local people in reservoir building
Construction of a small reservoir for collecting rainwater from the roof
IV- watershed management and protection in mountainous terrains

- Research Program on hill reservoirs in the Semi Arid zone of the Mediterranean Periphery (HYROMED)
- Countries concerned:
  - From the North: France (IRD), Sweden (Lund University), Spain (IRNAS-Sevilla), England (IH)
  - From the South: Syria (ACSAD), Lebanon, Tunisia (INGREF), Morocco (IAV)
- Objective: Study the Sustainability of small scale dam use or improvement of infrastructure and Socioeconomic in the Mediterranean landscape.
Figure 1- Syndiane watershed and its location on Syria map
Sindianeh dam-Syria

Monitoring of Reservoir Sedimentation
1998

Monitoring of Reservoir Sedimentation
2000
HYDROMED is a hydrological programme aims to optimize watershed management in mountainous terrains.
Main outputs

- One of the main output of the project was the development of a model for simulating surface runoff related to rain events.
- It was possible based on the data collected to investigate the use of antecedent soil moisture content as an alternative to the 5 days antecedent rainfall for curve number adjustment. A good correlation ($r^2 = 0.80$) were found between curve number values and the natural logarithm of antecedent soil moisture content which can help in improving estimation of runoff volume.
Figure 3- The relation between calibrated curve number and soil moisture content prior to each of the investigated 15 rainfall event.
Thanks For
Your
Kind Attention