DESIRE — A global initiative to combat desertification

February 2012

Info-brief 10

Water solutions in drylands

Addressing the 6th World Water Forum

Marseille, France, 12-17 March 2012

The World Water Forum is collecting solutions to problems with water supply, water quality and water use planning. They suggest that 7 criteria will help identify the **most promising solutions** for better use of water as a regionally scarce global resource:

1. **Strategic conformity** with a Forum target: the solution addresses a specific need or a problem in a way that helps reach the target
2. **Feasibility**: the solution has already been successfully implemented and shared
3. **Cost-effectiveness**: the solution yields significant impacts (outputs, outcomes) given the level of investments required (not only financial) and/or when compared to other possible solutions that could be applied to achieve the same target
4. **Demonstrated impact**: the solution's positive impact has been demonstrated and success factors have been identified
5. **Replicability**: the solution has potential for scaling up or replication in other contexts
6. **Commitment**: the solution has convinced a range of stakeholders to commit to implement it in the future
7. **Sustainability**: the solution can continue to deliver tangible positive social, economic and environmental impacts on the long run

The **DESIRE Project** has investigated and instigated a number of sustainable land management technologies that use water prudently. Some examples are described on the following pages.

R. Hessel

J. De Vente

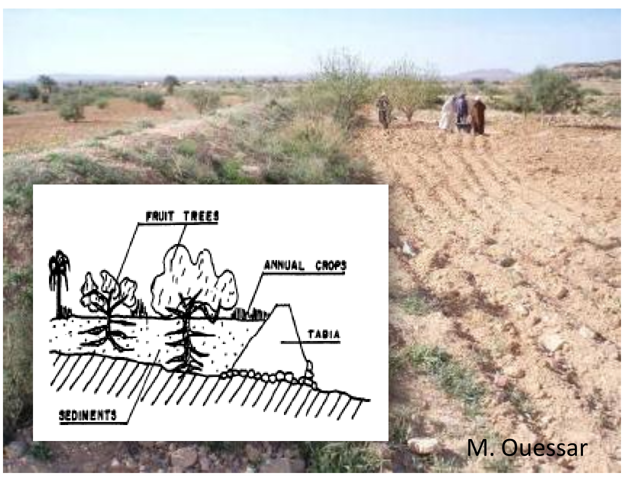
In drylands, the problems of too much, or too little water, need careful management, - to maintain people's livelihoods

Traditional technologies in the Zeuss-Koutine watershed, Tunisia

Traditional rainfed agriculture of fruit trees such as olives, wheat, legumes and vegetables continues but productivity tends to be low due to the very low and seasonally unreliable rainfall (averaging 100-200 mm annually). Water harvesting techniques (jessour and tabias) are used for the improvement of water content of soil and aquifers. The DESIRE Project has shown that at critical stages in the development of crops or tree fruits such as olives there is a great benefit in setting up and using temporary irrigation techniques. In this way a more reliable income can be achieved, but with very careful use of water resources. However, excessive pumping can make this vulnerable agricultural system unsustainable.

Jessour in the mountains of Béni Khédache

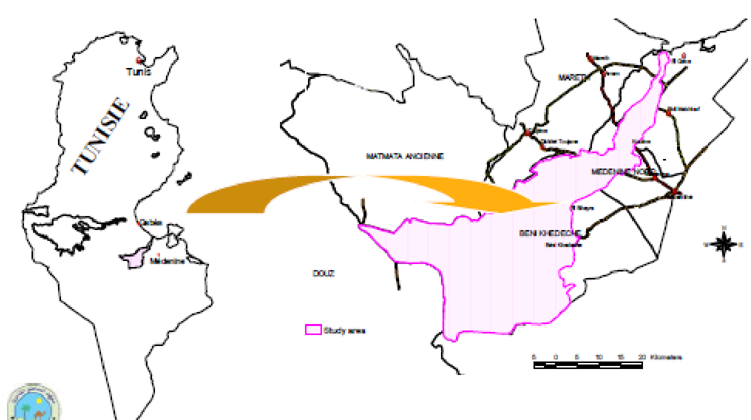
Replenishment of groundwater aquifers is helped through the recharge structures, - gabion check dams and recharge wells and cisterns.



Tabias in the piedmont area of Bhaira

Many herders now understand that if the rangelands show signs of soil degradation it is best to keep grazing livestock off the land for a while to rest it, and avoid more serious soil land vegetation loss. Retention of plant biodiversity and ecological synergies (where some plants may protect others) means that there is more chance of at least some plants surviving a particularly dry period and offering protection against soil erosion.

Survival of traditional agriculture is on a knife-edge. Unless the scarce water resources can be micro-managed to provide sustainable livelihoods, the land users will continue to abandon this area and seek more reliable employment in the towns. And if there is no-one to maintain water management structures, the risk of land degradation during the occasional intense rain storms increases.



Desire study site location in Tunisia

For more information see : http://tinyurl.com/7t7pryc

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Precision irrigation in Dzhanybek, Russia

The Dzhanybek study site is in the Volgograd region of the Russian Federation. It is in the SE corner of the Great Russian Plain near the lower reaches of the Volga river.

In this semi-desert region fresh water is very scarce, and agriculture is difficult. Soils and groundwater have become saline following decades of intensive irrigation using huge sprinkler systems. Despite that, the DESIRE Project has highlighted new sustainable successes in growing tomatoes and vegetables using drip irrigation.

Study site location

The Sobolev family planting tomatoes

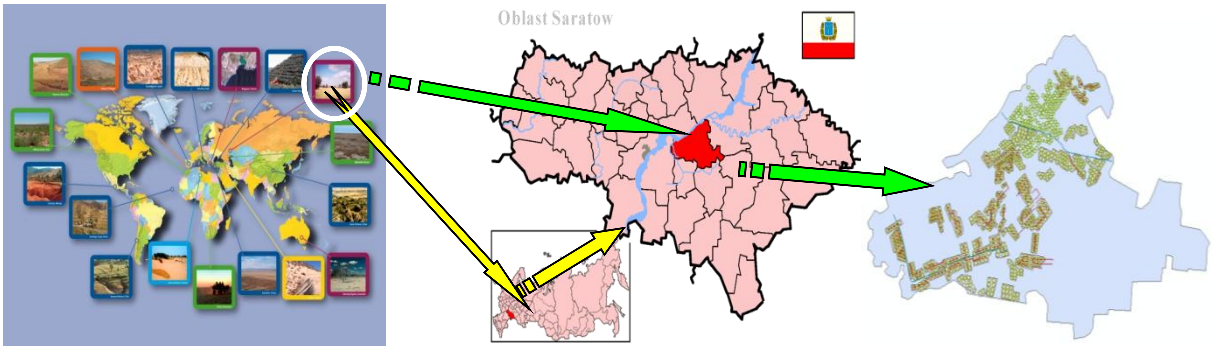
Since 2007 drip irrigation has been used on the land of the Sobolev family in Romashky village. This has proved to be more effective and more sustainable than furrow irrigation. The drip irrigation has precision control so that none of the precious water is wasted.

For more information see:
http://tinyurl.com/6wc9ue5
Contact: Prof. A. Zeiliguer azeiliguer@mail.ru

In the middle of tomato growing season water was taken from an underground well or cistern of fresh water harvested from snow melt at the end of the winter. The well was excavated in a local mezo-depression to collect a lens of fresh water within the salty ground water. In experiments there was not always sufficient water for irrigating the tomatoes, but the practice may be extended on the basis of this new experience.

Drip irrigation of tomatoes

Irrigation technologies in Novy, Russia



Since 1976 when widespread irrigation started there have been changes in soil cover due to the impact of the rise of ground water and increasing of soil salinity. Like the Dzhanybek site, the Novy study site is also in the Saratov region of the Great Russian Plain, near the lower reaches of the Volga river.

Growing vegetables with precision irrigation

For further information see:
http://tinyurl.com/7h7rffk
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As in Dzhanybek, the advantages of drip irrigation and precision sprinkler irrigation (with spatially variable rate) have been tested and shown to be successful. A system of measures is needed to stop ground water rising and causing waterlogging and development of secondary soil salinization. High level management of irrigation water supply, irrigation channel maintenance, use of sophisticated irrigation machines, and a change of policy for irrigation water pumping are among the measures that are needed in this area for future sustainability.

Retaining soil moisture in the Kelaigou watershed, Loess plateau, China

Terraces and check dams have been shown to be good technologies to reduce the soil and water loss in the research site. The availability of water for maize is increased through reduced runoff and evaporation from the land surface. Land behind check dams retains soil moisture longer than land elsewhere.

The terraces are wide so that planting can be done by machinery. The depth of infiltration of water on the terraces can be 20 -30 cm deeper than that on the slope. No runoff and soil erosion was measured on the terraces. The yield of maize in 2009 was around 4500 kg/ha, higher than the average annual yield of 2600-3700 kg/ha.

Wide terraces retain soil and soil moisture

Land behind check dams retains more soil moisture, plus more fertile sediments

For further information see:
http://tinyurl.com/8342ea3

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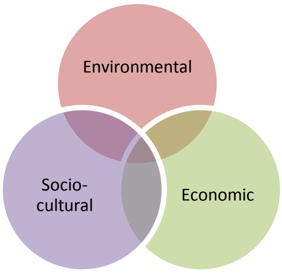
It is expensive to build check dams, but if the area of new soil held behind the dam is more than 3 ha, the increased yields do make it a very profitable technology. The best technologies have economic and socio-cultural benefits, as well as environmental benefits.



Testing soil properties under millet

Using the boquera in the Guadalentín basin, Spain

In south-east Spain lack of water for agriculture is a challenge. Recently there has been renewed interest in historical methods of water harvesting, particularly the revival of the boquera. A small earthen- or stone- built bund diverts flood water from intermittent streams towards cultivated fields with almond orchards and/or cereals. The diverted water will temporarily flood the fields and provide the crops with water.

For further information see:
http://tinyurl.com/7g9do52
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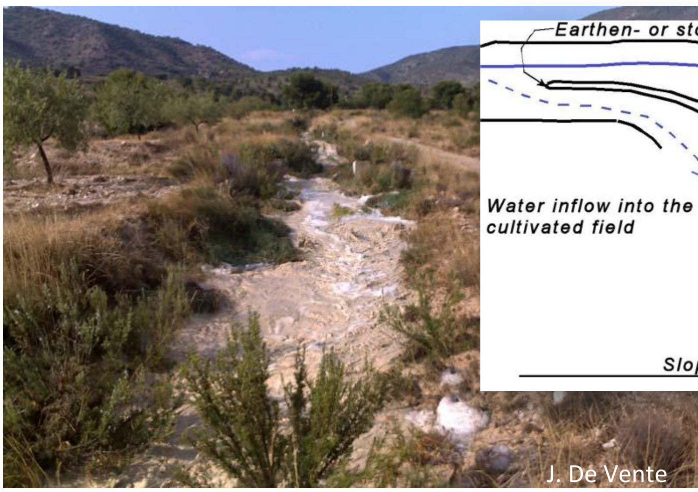
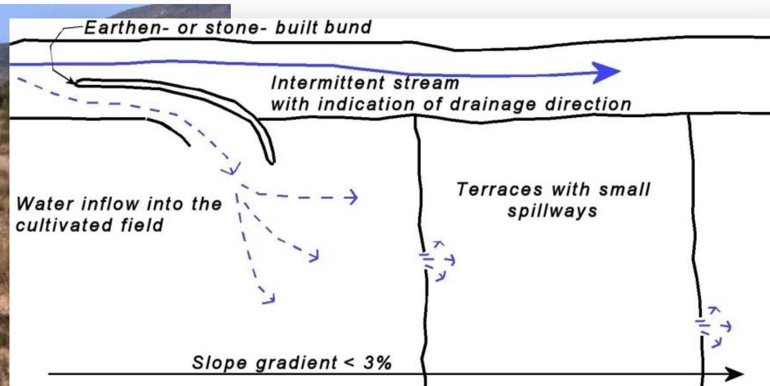




Water flow through the Acequia system, September 2009

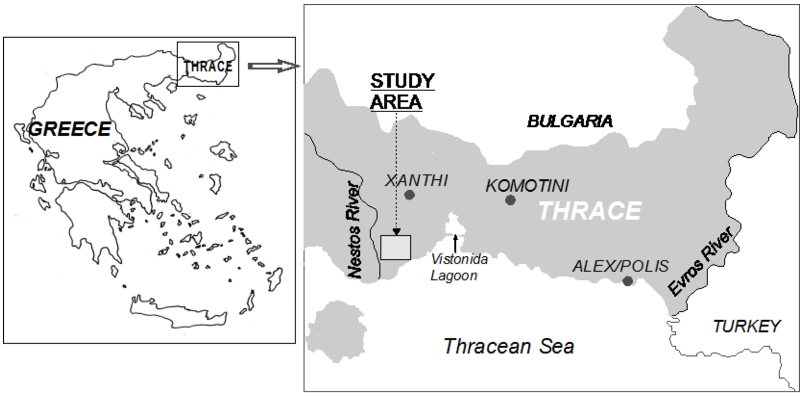
Water is diverted from one terrace to the next through small spillways in the terrace. The spillways can be fortified with stones to prevent bank gully formation. The extra input of surface water can double the almond yield. The use of these water harvesting structures is only possible under certain environmental and topographic conditions. The cultivated fields should be at a relatively short distance from an intermittent stream (<~50m), and the stream should have a sufficiently large upstream contributing area to provide significant amounts of runoff water during rainfall events. With these systems, water can be harvested up to 8 times per year, mostly in spring and autumn during high intensity rainfall events.

Diversion of water from the boquera to fields of almond trees

A well designed boquera system may provide up to 550 mm of additional water, in areas with an average annual rainfall of 300 mm.

Restoring saline soils for arable crops in Nestos, Greece

In the 1950s and 1960s, a drainage, flood protection, and wetland management scheme was set up on the Nestos delta. This changed the way in which groundwater was recharged, and restricted sources of surface water.



The aim had been to increase the area of cultivatable land, but the huge increase in demand for water for the crops resulted in widespread problems with soil salinization, decrease in groundwater storage, degradation of aquifers and gradual extinction of coastal wetlands. In Maggana in the eastern part of the Nestos river delta, soil salinity has become a problem for farmers after 20-30 years of pumping up water for irrigation. Over-pumping of the aquifer has resulted in seawater intrusion, and the level of saline groundwater is now only 1m below the surface.


V. Diamantis


A. Petchtelidis

One solution has been to build a canal (above) to bring in freshwater to the region. The water is diverted and pumped to the fields to be used in drip irrigation schemes. In the DESIRE Project the yield was 9.3 tn/ha with less salty surface water irrigation but only 3.4 tn/ha with salty groundwater irrigation (right) Note the white salts deposited on the surface of the saline soil.


J. Giougkis

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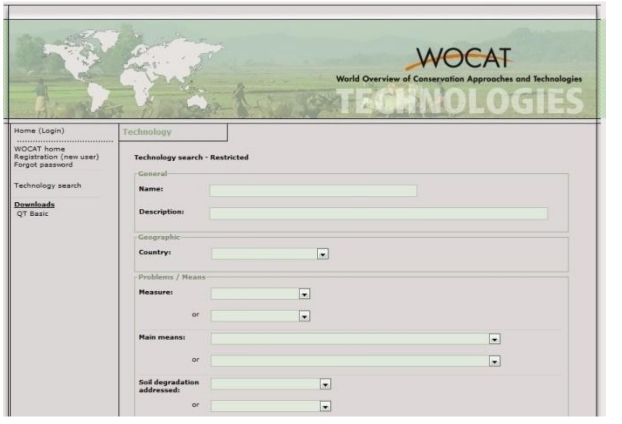
Key successes from the DESIRE Project

The DESIRE Project (2006-2012) has looked at the problems of land degradation, soil erosion and water use in 17 dryland study sites around the world. In all cases judicial use of water as a scarce resource is critical in order to sustain the livelihoods of all those who live and work on the land.

To help land users choose suitable and sustainable technologies to improve water availability, WOCAT has developed a procedure for identifying, assessing and selecting new strategies.



See details of the WOCAT database at http://tinyurl.com/6vmjxos

In some cases new technologies are becoming available. For example, drip irrigation may be controlled with precision, using computerised sensors of soil moisture, so that wasteful evaporation is minimised. In other areas it is the older, traditional methods that are proving their worth. Various methods of retaining, storing and diverting water to crops, as and when it is needed, have shown that expensive or sophisticated technologies are not always necessary for good results.


Jessour

Tunisia – Jesser, Katra, Tabias (Arabic)

The DESIRE Project has a Harmonised Information System that houses all the information and results over 5 years of research, see http://www.desire-his.eu/ The information is arranged according to the succession of tasks and also according to each study site. Here you will find the scientific evidence for how well various technologies for sustainable land management do work. All the technologies have been studied in close cooperation with local stakeholders. Many technologies will also be described in a forthcoming DESIRE-WOCAT book: "Desire for greener land".

DESIRE is contributing to the 6th World Water Forum see: http://www.worldwaterforum6.org/en/. DESIRE will join a Round Table with the CSFD (French Focal Point of the UNCCD) and exhibit posters, booklets, leaflets, etc.

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Nichola Geeson, using material from various DESIRE partners. Photos courtesy of DESIRE partners

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http://www.desire-project.eu

http://www.desire-his.eu/

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DESIRE A global initiative to combat desertification

SIXTH FRAMEWORK PROGRAMME