

A bridge between Mediterranean cultures

The cultural role of traditional irrigation techniques

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An overview on traditional irrigation techniques

Acknowledge the importance of traditional knowledge

Techniques investigation and classification

Classification

Investigations

Diversification and adaptation of traditional techniques

A bridge between Mediterranean cultures: the experience in Brescia

The student group Al-Biruni

A common framework to understand and contrast desertification

The exhibition of traditional irrigation

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Why to study traditional irrigation techniques?¹

1. They are a cultural heritage and a local identity
2. They are one axle of the oases and a defense against desertification
3. **They are traditional but not endogenous**, they go beyond local costumes and are projected in an ecumenical dimension of culture
4. They are flexible and dynamic, or in other words *coevolutive*; the very concept of scarcity is linked to the idea of interaction
5. Arid climates may be considered a proxy of climate change effects in temperate climates
6. Traditional techniques allow to cultivate peripheral areas, thus stimulating biodiversity and mitigating hydrogeological risk
7. *Alpine Sublitoranean climate is typically wet, however slopes are often in water scarcity conditions*

¹Barontini S., Badiani B., Boselli V., Peli M., Pezzotti D., Quarta R. & Vitale N., Sul significato culturale delle tecniche irrigue tradizionali in scarsità idrica, *Officina**, 22:10—15, 2018



An overview on traditional irrigation techniques

Cultural thread across Asia, Africa and Europe

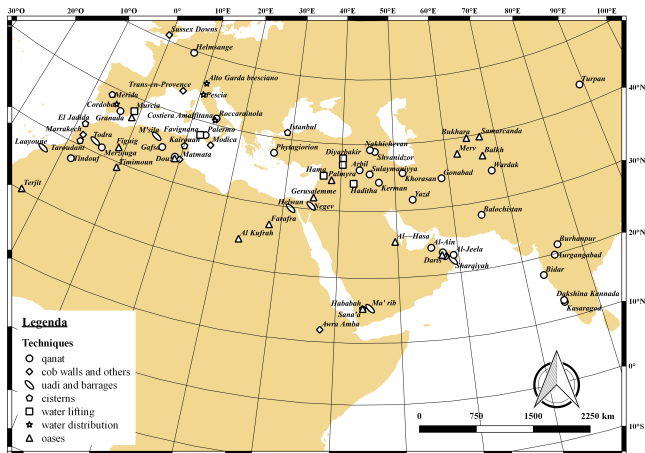


Figura: Spread of traditional irrigation techniques across Asia, Africa and Europe.

UNCCD recalls on traditional knowledge

UNCCD Secretariat (2005, p.50):²

7. *In the discussion by the Panel it was stated that traditional knowledge:*

(a) *Has an important economic role; generates social and cultural benefits and values; is dynamic and adapts to change; needs an enabling environment to be developed and to reproduce itself; cannot just be listed, as it is not static information but rather time, context and actor-specific living knowledge.*

(b) *Moreover, traditional knowledge also integrates modern knowledge, evolves, and spreads to create regional traditions; it should not be glorified blindly but carefully evaluated in its contribution to sustainable resource management; the term “traditional knowledge” also includes very old, forgotten techniques; it is a plural term, indicating the diversity of the knowledge of other cultures (...).*

²UNCCD (2005) *Revitalizing Traditional Knowledge. A Compilation of Documents and Reports from 1997—2003*. UNCCD, Bonn, Germany; for further reading UNCCD and World Bank (2017) *Land for life. Create wealth, transform lives*. UNCCD, Bonn, Germany.

On the cultural and agronomical role of the irrigation

UNCCD Secretariat (2005, p.51):³

15. *One of the most successful techniques for the rehabilitation of strongly degraded land in the Sahel is the improved traditional planting pit or "zai". This traditional technique was improved in the early 1980's by a farmer in the Yatenga region of Burkina Faso. He increased the diameter and the depth of the traditional pits and put manure in them during the dry season. (...)*

16. *The most widespread system characteristic of the Mediterranean area is the terracing system that can be found in the Middle East, Greece, Italy and Portugal. (...) The aesthetic qualities, the beauty of natural materials, the comfort of architecture and spaces, the organic relationship with the landscape that the ancient towns of the area boast are especially due to the qualities of traditional techniques and to the search for symbiosis and harmony intrinsic in local knowledge. The survival of traditional societies in the whole Mediterranean area depends on the effective, economic and sustainable management of natural resources. In the Mediterranean area, which is characterised by intensive settlement, the environment is not only the result of natural processes, but rather represents a cultural landscape where historical centres are the crystallization of knowledge appropriate to environmental management and maintenance.*

³UNCCD (2005) *Revitalizing Traditional Knowledge. A Compilation of Documents and Reports from 1997—2003.*

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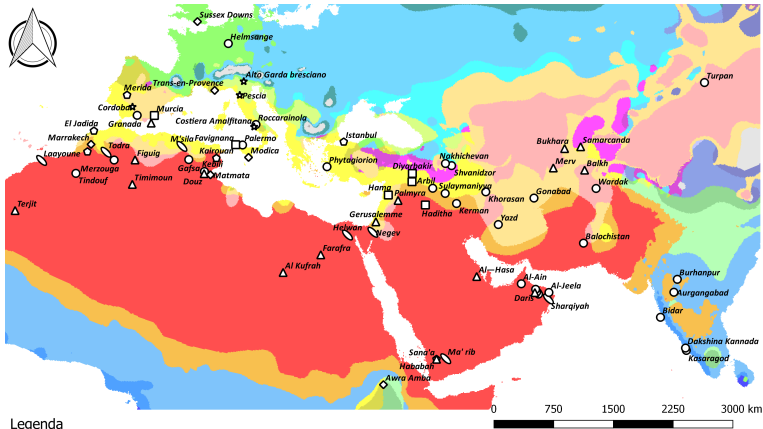
Classification

A proposed classification

1. Water table drainage: *qānāt, foggara, khattara, pits*
2. Atmospheric moisture harvesting: *cob walls, raw earth walls, tu'rat*
3. Rainfall collection: *zai, wadi, barrages, cisterns*
4. Water lifting systems: *shadouf, saqiyya, naoor*
5. Distribution systems

Classification

Spread of traditional irrigation techniques across Asia, Africa and Europe



Legenda

Tecniche

○ qanat

◇ muretti a secco e altre tecniche a condensazione

△ uadi e barrage

○ cisterne

□ tecniche di sollevamento dell'acqua

★ sistemi di distribuzione dell'acqua

△ oasi

K-G CC

■ Af

■ Am

■ Aw

■ BWh

■ BWk

■ BSh

■ BSK

■ Csa

■ Csb

■ Csc

■ Cwa

■ Cwb

■ Cwc

■ Cfa

■ Csc

■ Cwa

■ Cwb

■ Dsa

■ Dsb

■ Dsc

■ Dwa

■ Dwb

■ Dwc

■ Dsd

■ Ddb

■ Dfb

■ Dfd

■ ET

■ EF

Main and ancillary sources II



Citrus garden at Pozzallo (Sicilia). Ph: N. Vitale

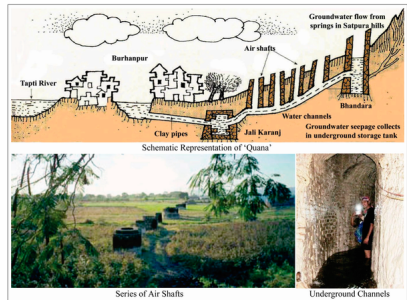
Water harvesting in a citrus garden:

- ▶ Main source: precipitation
- ▶ Ancillary source: atmospheric moisture harvesting, inhibition of bare-soil evaporation

Diversification and adaptation of traditional techniques

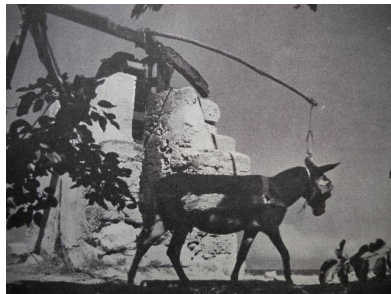
Kettara e Qānāt

Kariz in Iran



Khooni bandhara in Madhya Pradesh

Saqiya e Senia



Saqiya in Mali (1924, fonte: <https://dianabuja.wordpress.com/>, left) and “*noria*” or *senia* in western Sicily (1953, source: <https://reportagesicilia.blogspot.it/>, right).

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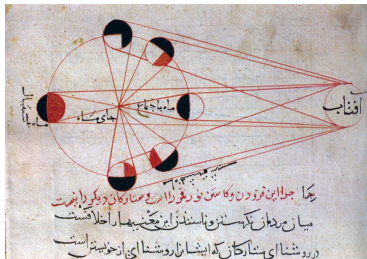
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The city of Brescia and its context

- ▶ Industrial province in Northern Italy
- ▶ Rapidly increasing migrants presence:
from $60.1 \cdot 10^3$ people at 1-1-2001 to $202.6 \cdot 10^3$ people at 1-7-2011 (Source: ISMU–ORIM)
- ▶ One of the Italian provinces with greatest migrant percentage:
19% in Brescia–city, 13.6% in Brescia–province,
10.7% in Lombardy, 7.5% in Italy
(Source: Camera di Commercio, data of 2011)
- ▶ A great challenge for the city: **social conflict** or cultural integration?

The study group “Al-Bīrūnī”



Al-Bīrūnī, Studies on the lunar eclipse

- ▶ After the figure of the Persian scientist Abū Raidhān Al-Bīrūnī (973–c., 1051)
- ▶ Students of different courses (engineering, law and medicine) belonging both to the Arabian and local community
- ▶ Cooperation with experts and researchers
- ▶ Organization of cultural events in which the contribution of the Arabian and Islamic culture to the development of the European one in the middle ages is investigated

Desertification as soil degradation I

Şen 2008 [p.3—4]:⁴

Desertification is a slowly creeping phenomenon, which for various reasons takes place in any area over a long period. In general desertification implies decrease in some significant meteorological and agricultural quantities such as rainfall, vegetation coverage, surface water extensions, groundwater level drops, and crop yields. On the other hand, increase in climate temperature, sand coverage, drought coverage, urban area expansion, and sedimentation also imply desertification.

Desertification as soil degradation II

Şen 2008[p.4—5]:

A common misapprehension about desertification is that it spreads from an arid region such as a desert core (...). Land degradation can and does occur far from any climatic arid region. (...) [Desertification] begins usually as a spot on the land, where land abuse has become excessive.

(...) A second misconception is that droughts are responsible for desertification. Droughts cause increase in the likelihood that the rate of degradation will increase on nonirrigated land if the carrying capacity is exceeded. However, well-managed land will recover from droughts with minimal adverse effects when the rainfalls return. The deadly combination is land abuse during good periods and its continuation during periods of deficient rainfall.

Soil degradation drivers

La Thematic Strategy for Soil Protection⁵ from UE identifies **eight soil degradation drivers**:

1. Erosion (C–d: precipitation, wind, A–d: agricultural pro–erosive practices, weeding)
2. Loss of organic matter (**C–f: loss of organic carbon tanks**)
3. Compaction (typically A–d: overgrazing, heavy agricultural machinery use)
4. Salinization (C–d: evaporation from water table, saline intrusion, A–d: potassium and sodium contamination in irrigation water, salt on the streets, irrigation water evaporation)
5. Landslides (mainly C–d, but A–d too)
6. Contamination (A–d)
7. Sealing (A–d)
8. Loss of biodiversity (driven by other processes, **it has C–f**)

⁵Documents SEC(2006)1165, SEC(2006)620

WSD and IYS' suggestions

Resolution A/C.2/68/L.21 of the 68th UN GA:

... the sustainability of soils is key to addressing the pressures of a growing population and (...) recognition, advocacy and support for promoting sustainable management of soils can contribute to healthy soils and thus to a food-secure world and to stable and sustainably used ecosystems, ... urgent need at all levels to raise awareness and to promote sustainability of the limited soil resources using the best available scientific information and building on all dimensions of sustainable development

Concept of the exhibition:

- ▶ Water as key resource for agriculture and soil conservation
- ▶ Scarcity conditions as a challenge for sustainability

“Irrigation techniques in water scarcity conditions”⁶

The documentary exhibition aims at disseminating two main concepts:

1. The **technological continuity** of some water supply systems in countries, around the Mediterranean Sea, affected by similar conditions of water availability
2. The possibility of building environments where, due to severe or extreme climatic conditions, the man can only live in **equilibrium with the nature**.

⁶Barontini S., Boselli V., Louki A., Ben Slima Z., Ghaouch F. E., Labaran R., Raffelli G., Peli M., Al Ani A. M., Vitale N., Borroni M., Martello N., Bettoni B., Negm A., Grossi G., Tomirotti M., Ranzi R., Bacchi B. (2017) Bridging Mediterranean cultures in the International Year of Soils 2015: a documentary exhibition on irrigation techniques in water scarcity conditions, *Hydrology Research* Jun 2017, 48 (3) 789—801.

Structure of the exhibition

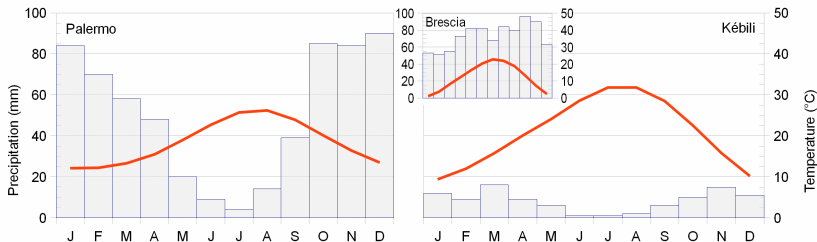
Modular structure involving up to 20 posters in 70 cm × 100 cm format, organised as it follows:

1. Introduction
 2. Water table drainage: *qānāt, foggara, khattara, pits*
 3. Atmospheric moisture harvesting: *cob walls, raw earth walls, tu'rat*
 4. Rainfall collection: *zai, wadi, barrages, cisterns*
 5. Water lifting systems: *shadouf, saqiyya, naoor*
 6. Distribution systems
 7. *Oases*
- (The exhibition is in Italian and the target is a not-expert public)

Structure of a modulus

For each modulus it is presented:

1. The hydraulic concept
2. Aspects of the traditional building techniques
3. Some historical examples with
 - ▶ geographical position on the same Mediterranean basin map
 - ▶ the climatic diagram



Data source: <http://www.climate-data.org>

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The study of traditional irrigation techniques is in our opinion important for:

- ▶ The great cultural value of traditional knowledge
- ▶ The possibility that these techniques offers to contrast climate change, desertification and biodiversity loss

Moreover from an academic perspective they offer a wide terrain for interdisciplinary and cross-cultural studies and cooperation.

Thanks for your attention.
Let's stay in touch
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