CULTURAL PRACTICE

AGRICULTURAL TERRACES

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AGRICULTURAL TERRACES ARE AN IMPORTANT PRACTICE THAT ARE FOUND IN MANY HILLY AND MOUNTAINOUS REGIONS IN THE WORLD.

Due to the shortage of arable land in these regions, people had to resort to techniques to make use of the hilly slopes that they were living on. Agricultural fields exist in all sizes and forms, and can be found from the highlands of Peru until the hilly slopes of Indonesia. The earliest records for agricultural terraces date back to the first millennium AD (Turner et al. 2021).

In the Mediterranean regions, agricultural terraces have an important link with the ancient cultures that used to live there. They can be found in the mountainous regions in almost all the countries around the Mediterranean basin. These terraces were used to cultivate a variety of crops, such as cereals, wine, olives, walnuts, almonds, citrus and other fruits (Asins-Velis 2006). These landscapes represent an extensive knowledge on soil and water dynamics collected by farmers for centuries (Asins-Velis 2006).

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1. CULTURAL SUSTAINABLE LAND-USE PRACTICES

Agricultural terraces allow us to use the sloping terrains of mountains and hills efficiently and retain both soil and water for agricultural purposes. Different types of terraces can be distinguished across the world, varying by shape, structure and construction material (stones, concrete, earth). However, all terraces share the same function and the same basic features (Cicinelli et al. 2021). An agricultural terrace is created through the rearrangement of the original soil into another configuration. By principle this means removing part of the original slope and placing it into a higher or lower portion of the slope, either to prolong the horizontal part or create vertical forms as a barrier (Corrieri et al. 2021). Although the types of terraces have been classified through different classification, the overall most found form in the Mediterranean basin are the dry stone terraces (Cicinelli et al. 2021).

A human-induced environmental system for centuries, the positive effects of agricultural terraces are receiving more attention and research in recent years (Brown et al. 2021). With the need for sustainable agriculture, the effects of climate change and the rapidly transforming demographics in Mediterranean countries, terracing provides an ingenious and resilient method to maximize food and human capital in an environmentally friendly way (Brown et al. 2021). They provide a variety of ecosystem services, including a reduction of runoff by more than 41% and an increase in soil moisture of 12.9% (Deng et al. 2021).

THREATS TO THE PRACTICE

The preservation of these agricultural terraces depends on a lot of factors, but most importantly on the maintenance by human activity (Cicinelli et al. 2021). With the increased competition from the globalization of agriculture, farmers are receiving a lower income for the demanding labour to maintain agricultural terraces, causing many to abandon the practice altogether (Sakellariou et al. 2021). There is especially a lack of interest for the practice among the younger generations who are mainly moving to the cities in search of opportunities (Heider et al. 2021).

Other causes underlying the abandonment of agricultural terraces are land fragmentation and lack of modernization, long-lasting wars and oppressions causing people to flee from their region, and also the emotional bonds of farmers to their ancestral lands prevents them from selling them (Corrieri et al. 2021; Heider et al. 2021). The lack of human activity for the maintenance of agricultural terraces leads to severe problems with the abandoned landscapes. The abandonment is associated with an increase in soil erosion, higher risk of wildfires but also a loss of biodiversity, cultural heritage and historical knowledge (Heider et al. 2021).

RECOGNITION AND FUNDING

The protection of these terraced landscapes is being recognized under many EU regulations, including through the Common Agricultural Policy (Cicinelli et al. 2021). The hilly and mountainous regions where these terraces occur are deemed less-favoured areas in the EU definition, providing farmers the option to receive funding in order to preserve them (Stanchi et al. 2021). Furthermore, several ancient terraced fields have been recognized as globally important agricultural heritage systems by the GIAHS program, launched by the Food and Agriculture Organization (FAO) of the United Nations (Deng et al. 2021). Increasing emphasis is being put on the cultural and historical values of these practices present in the Mediterranean basin (Deng et al. 2021).

	INTENSIVE CROPS	LOW INPUT CROPS	ABANDONED TERRACES	RESTORED TERRACES
CROP	Apples (pears, peaches)	Olives (apples)		Various (fruits, herbs, vegetables...)
PESTICIDES	✔ Frequent use	✔ ✖ Low or no use		✔ ✖ Low or no use
IRRIGATION	✔ Conventional	✔ ✖ Convent or fainfed		✔ ✖ Convent or fainfed
TILLAGE	✔ Deep	✔ ✖ Shallow or no		✔ Partial
FERTILISERS	✔ Inorganic	✔ ✖ Manure or no		✔ Manure

Table 1. Information on the 4 different management types of the 26 agricultural terrace sites in Al Shouf Cedar Nature Reserve/West Bekaa in Lebanon (restored terraces only in Shouf). Source: © Shouf Biosphere Reserve

RESEARCH BY THE ALLIANCE FOR MEDITERRANEAN NATURE AND CULTURE (AMNC)

Several studies have recognized the relevance of agricultural terraces, but there is a lack of knowledge on how to preserve them (Cicinelli et al. 2021). Most often, there is also a lack of active interaction with the farmers to see what could be beneficial for the stability of the terraces or on the comparison of terraced and non-terraced fields (Cicinelli et al. 2021; Deng et al. 2021). Finally, there is no clear consensus on the pricing of the ecological resources that agricultural terraces provide, nor is there a lot of knowledge on the biodiversity being lost by the abandonment of terraces (Cicinelli et al. 2021; Deng et al. 2021).

The latter has been the focus of a recent study by AMNC in the Al Shouf Cedar Nature Reserve in Lebanon, where a large survey was undertaken on the biodiversity of plants, insects, reptiles and birds in agricultural terraces (Table 1). A total of 19 sites were chosen, with 4 different types of management (low managed terraces, intensively managed terraces, restored terraces and abandoned terraces). By comparing the results on species diversity between the managed terraces, an idea could be formed on the importance of agricultural terraces for the survival of some species.

2. BENEFITS OF THE PRACTICE

2.1. BIODIVERSITY

The increased amount of nutrient and rainfall absorption in agricultural terraces benefits the plant growth. This leads to a higher biodiversity in these agricultural landscapes, compared to the harsh slopes of the mountainous regions (Shimod & Koyanagi 2017). The diverse landscapes with water management and crops allow for growing conditions for different species that increases the amount of biodiversity (Deng et al. 2021). Several studies have shown that there is an increase of 30 to 70% of biomass on terraced fields compared to non-terraced fields in similar environmental conditions (Deng et al. 2021).

The abandonment of agricultural terraces usually leads towards a decline in the biodiversity, with more low herbaceous flora being present (Bevan et al. 2013). In the long run, there could be an increase in biodiversity of the abandoned agricultural terraces, with a complete transformation of the vegetation leading towards a recovery of the natural landscape, but losing the cultural landscape that coincides with it (Bevan et al. 2013; Cicinelli et al. 2021).

Aerial view on dry stone terraces, Lebanon © Shouf Biosphere Reserve

From the research done in Al Shouf Cedar Nature Reserve, it was also apparent that the highest biodiversity was not necessarily found in the currently managed terraces. Some species, such as aromatic small shrubs and high-quality perennial grass species were rather found in the abandoned terraces and also in the restored terraces.

2.2. CULTURAL

Dating back to the earliest civilization, but most intensively constructed during the later Middle Ages (c. AD 1100-1600), agricultural terraces are one of the most noticeable landscapes in the Mediterranean region (Lasanta et al. 2013; Turner et al. 2021). They are strongly interlinked with historical and traditional heritage of the local farmers, and promotion is needed towards recognition of their function and value (Mongil Manso et al. 2021).

The ancient knowledge on the diverse types of terrace constructions and the associated practices of water catchment, harvesting and distribution structures of the local communities are increasingly under threat of being lost forever, mainly by the labour intensive work and lack of interest for the practice among the younger generations (Asins-Velis 2006; Heider et al. 2021).

Their aesthetics and charm captivate the attention of visitors and they make an interesting touristic resource (Heider et al. 2021; Lasanta et al. 2013). Many of the well-known ancient terraced fields on the GIAHS list provide a large income for the local residents (Deng et al. 2021). Sometimes the touristic income can be more lucrative than the revenues from agriculture, causing farmers to abandon their terraces (Cicinelli et al. 2021).

2.3. CLIMATE CHANGE

By modifying the relief of mountainous and hilly regions, agricultural terraces provide several environmental benefits that could mitigate the risk from climate change, such as (Deng et al. 2021; Sakellariou et al. 2021):

- Improve the rainfall absorbency
- Control for soil erosion
- Reduce runoff
- Biomass accumulation
- Smooth extreme summer temperatures
- Mitigate the risks from floods and forest fires
- Protection against mass movements or landslides
- Habitat and biodiversity protection

The same benefits also become negative consequences when the terraces are abandoned and no longer cared for, especially at a regional level (Brown et al. 2021). The Mediterranean summers are characterized by long dry periods followed by intensive and abrupt periods of rainfall that can cause havoc on the abandoned terraces in the mountainous ranges (Sakellariou et al. 2021). Several studies have reported deterioration of soil quality and higher risks for soil erosion after the abandonment of agricultural terraces (Deng et al. 2021; Lasanta et al. 2013).

Discussion between farmers overlooking agricultural terraces in West Bekaa, Lebanon © Jamal Hamzeh SPNL

Agricultural terraces High Atlas, Morocco © Pommelien Da Silva GDF

2.4. SOCIO-ECONOMICAL

No matter the type of agricultural terrace, they all provide an increase of arable land and agricultural productivity per unit of planimetric land area. Several studies have found increases in crop yields ranging from near zero to more than 60%, with an extreme case in Tanzania of 270% (Brown et al. 2021; Deng et al. 2021). These productive agricultural systems allowed for and required a higher population density, that nowadays is actually decreasing due to competition by the less labour costly agriculture on the lowlands of Europe (Brown et al. 2021). Agricultural terraces lend themselves well to the cultivation of high-quality crops of greater value and prestige, such as wine, olives and almonds (Lasanta et al. 2013).

Nowadays, many terraces have been converted from the traditional multi-cropping to single crop landscapes, especially towards vineyards (Brown et al. 2021). However, these landscapes could provide suitable areas for ecological agriculture or reforestation and could provide a source of food security, income and employment for many people (Heider et al. 2021, Lasanta et al. 2013).

An interesting option that has been suggested by many researchers and has been tested in some countries, is the renting of the agricultural terraces to hobby farmers and city dwellers (Cicinelli et al. 2021). Besides the incomes from tourism, this might provide a resource that could help maintain this cultural heritage practice.

Dry stone terraces, Lebanon
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