In Search of Eden

Landscape laboratory for the enrichment of abandoned orchards in the Barranco de Tremps, Matarraña, Aragón, Spain

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Abstract

The Barranco de Tremps is one of many valleys in the vast hills of the region of Aragón, in the northeast of Spain. A barranco is a natural watercourse created by excessive rainfall, visible only as a dry river bed in summer. Such watercourses and riverbeds are no longer present in this valley.
Today, the valley is full of olive and almond orchards surrounded by pine forests. Summers are increasingly hot and without rain. Since the advent of the tractor in the late 1980s, the soil is ploughed more often and more deeply, and there is little soil life left. During the winter months, wind and rain erode the bare soil, which absorbs almost no rainwater. The water retaining old stone walls have been breached by new wider tractor access paths, through which rainwater also washes away.

Eight hectares of orchards and forest in this valley are owned and cared for by a landscape architect and her partner. A longing to work closer to nature and a desire to transform a semi-arid area into a rich and biodiverse landscape brought them to this spot. They are exploring old and new horticulture techniques to enrich the terrain with diverse planting, to improve soil quality and increase its ability to hold water. Some of these experiments fail, some succeed. In this in-situ laboratory, all experiences contribute to the knowledge of the relationships between soil, vegetation, land use, cultivation, and water cycles.

This visual report gives an impression of the terrain, shows the various experiments of the past two years and the gradual development of spatial principles for design and management.

Keywords

Landscape architecture, in situ design research, semi-arid landscape, land management, maintenance, fresh water resource management, rainwater harvesting, reforestation

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Location

FIGURE 1 The site is located between the rivers Guadalope and Matarraña

The Barranco is close to the village of Mazaléon, between the Guadalope and Matarraña rivers in the Aragón region. The area slopes down from the Iberian Mountains to the lowlands of the Ebro Delta. The hilly landscape is relatively green and its valleys come in many different shapes.

The valley is named after the 520-metre high hilltop, the Tremps. The site is situated at the beginning of the 9-kilometre long valley that runs off to the west into the Embalse de Caspe, the barrage in the Guadalope river tapped to irrigate the surrounding land. Today, there is no trace left of the watercourse that once flowed through the valley strip.

Love

For many years, we have been fascinated by the impressive developments of reforestation and re-greening projects in Africa and Asia. At this very spot in Spain, we have the opportunity to explore and experiment in re-greening by working on the land. Exploring an unknown territory, connecting with the landscape, and the possibility to exchange ideas are some of our motives for this undertaking. More simply, this adventure is about our love for trees, landscape, and nature.

Laboratory

We are experimenting with several techniques. We acquire knowledge by talking to local farmers and residents, looking into publications and research, into centuries-old practices and methods, as well as innovative techniques. Moreover, we carefully observe the terrain, like the continuous changes during the day and across the seasons.

FIGURE 2 Long lines of the stone walls in the orchards contrast with the dark pine forests.

FIGURE 3 In the scattered barns, different families used to live and work together during harvest time.

The stone walls[1], a land cultivation practice dating back to the early middle ages, and overgrown vegetated ramps between the terraces follow the height lines of the terrain. These remarkable lines, together with the grey-green olive trees, contrast with the dark pine forests on the top of the hills.

Happy days

Until the late 1970s, before the advent of the tractor, several families lived in stone barns for a few weeks each year to harvest and work on the land. The locals tell us stories about eating, singing, and dancing together in those old, happy days. They say it rained more and often, the temperature was lower, and stormwater was retained by the terraces that preserved enough water to grow vegetables, allowing them to eat from their own gardens. In recent years, the small-scale, scattered orchards are no longer profitable and are not maintained as well as they once were.

FIGURE 4 Summer 2019

FIGURE 5 Winter 2019

Water cycle - year round

Summers are increasingly hot and dry; the temperature can rise to 40 degrees Celsius and there is no rain for many months. The soil is rock-hard. Due to the constant deep ploughing, the soil in the orchards has lain fallow for decades. We have observed little remaining life in the soil.

In the winter, the rain is harsh and heavy. Swirling streams of water gush down from the flattened terraces, causing erosion and loss of topsoil. The soil is soft and soggy. On average, 350 mm of water falls per year, mainly in the winter season.

1 Most of Spain was brought into culture by the Moors from 711 onwards. The quality of the most beautiful walls in this region are attributed to the skill and knowledge of the Moors. In the middle of the last century, the walls were neglected and later destroyed by the rough work of the tractor. The walls on our site are of varying quality and were probably made in the late Middle Ages.

FIGURE 6 Early morning mist

Presence of water

In spring and autumn, water is subtly present. Every day, a moment appears when the water shows itself; for example, right before the sun rises over the hill, in the early morning mist, or when you dig deep into the mulch, or as thick drops on branches,and since this year, the water of the night lingers longer in the emerging vetch and winter grain.

FIGURE 7 Moist mulch

FIGURE 8 Morning drops

FIGURE 9 Dew in emerging grain

FIGURE 10 The barn after renovation

Off Grid

The barn has been converted into a comfortable 'off grid' home. Solar panels generate electricity while rainwater is harvested in a newly built underground cistern. It is a remote place; only the farmers of the surrounding plots occasionally drop by for a chat. The isolation and the daily work on the land, as well as the overwhelming heat and drought, the strong wind, and the rare but heavy rain have changed us. In the Netherlands, we work systematically, often with a defined goal and clear steps to achieve it. In the valley, plans are made as we go along. Ever-evolving new insights, responding to the present circumstances, and plain pragmatism guide us on how to gradually transform the land and to live and work with nature.

Planting Water

The concept 'Planting water' was our first leitmotiv: roots, shade, and falling leaves enrich the soil with nutrients and improve water retaining capacity of the soil. We used various planting techniques, such as the Dutch Groasisbox[2], the Brazilian Syntropic Agroforestry planting method[3], treeprotectors for individual trees and the installation of irrigation hoses close to the plantings. All of these are done with the aim of improving the growing conditions of new trees, and with success; the majority have taken root and are starting to grow.

FIGURE 11 Preparation

FIGURE 12 Placement of Groasis box

FIGURE 13 Removal

FIGURE 14 Aftercare

A Groasis box is filled with 16 litres of water when placed. Rain and dew water can be collected through the white lid. A small string in the bottom of the box gives just enough water to the young plantings to keep them alive. This tree-linked irrigation method supports the development of the roots in the first season. After a year the tree is able to stand alone and the box is reused for a new tree.

2 Groasis Waterboxx is an instrument developed to grow trees in dry, deserted areas and rocks. The patented Waterboxx consists of a water container with a cut-out for planting the seedling in dry soil. At the bottom of the Waterboxx, there is a cut-out with a moisture-conducting string that is applied next to the seedling's roots when planting. Thanks to this artificial but limited moisture supply, the roots grow into the deeper soil, unlike sprinkler or drip irrigation, allowing the young plant to survive dry periods.

3 Syntropic Agroforestry is a design and management method for agriculture and forestry developed by the Brazilian Ernst Götsch. The method is based on understanding and imitating natural growth and succession processes. Some of its characteristics are: very dense sowing and planting distances, planting structure with many species in layers and strategic frequent pruning.

FIGURE 15 Preparing planting beds

FIGURE 16 Vetch explosion

FIGURE 17 Protecting remaining trees

At two locations, herb, shrub, and tree layers are planted very closely together on rills flanked by horse manure, according to the ideas of Syntropic Agroforestry. The rills are sawn with green manure crops and winter grain, visible in the middle picture. The densely planted trees, in combination with the frequent pruning of the fast-growing trees, increases the vigour of the young trees, according to the theory. Unfortunately, due to the unforeseen explosion of vetch and the voraciousness of the wild animals, both of which were rampant during our unforeseen absence, the herb and shrub layers did not survive. The remaining trees are now sticked in plastic tubes, for extra protection from sun, wind, and animal attacks.

FIGURE 18 Hoses & strings

FIGURE 19 Caps

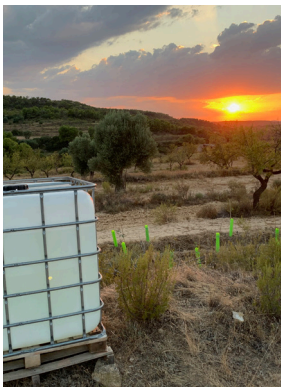

FIGURE 20 IBC tank

FIGURE 21 System of hoses

Large plastic IBCs[4] are filled with water, which is piped to the young trees through a system of hoses. Next to the trees, a hose with a string is placed vertically in the ground. This is a system that we created ourselves and, with the help of a timer, worked fairly well last year.

4 An IBC is a Intermate Bulk Container engineered for the mass handling, transport, and storage of liquids e.o.

FIGURE 22 Digging swales..

FIGURE 23 ...on a horizontal contour line

Swales

We try to keep the rain on the land for long as possible, by digging swales and creating ridges and small dykes. A swale is a shallow channel with gently sloping sides on a horizontal contour line. The swales we made are infiltration basins, designed to manage and slow down water runoff and increase rainwater infiltration in a deeper layer of the ground.

The swales were dug by a large excavator in a steep sloped hillside surrounded by abandoned groves where the soil had eroded due to wind and water and had been taken over by pioneer species. In wintertime, a good amount of water remains in the swales after heavy rainfall. The collected water sinks through a deeper layer into the bottom of the hill, causing it to stay longer in the terrain.

FIGURE 24 Filled swale in wintertime

Soil

From experience so far, we have noted that the improvement of the soil is, more than planting trees, most crucial for the development of the terrain. The cessation of deep ploughing makes a big difference for instance. From start we cultivated the land in various ways with the aim of improving structure and permeability of the soil and soil life, so that more water is retained in the soil.

FIGURE 25 The soil is covered with fresh green grain in spring 2020.

Grains

We have been sowing winter wheat and nitrogen fixatives such as vetch, wheat, oats and barley. Last spring, our part of the valley was extremely green. We noticed a lot of bees, insects, birds, and even a mole. In autumn, the vetches and grain are mowed with a flail mower. The clippings are left on the land to create a nutarian rich soil.

In the coming seasons, we will continue to experiment with different forms of tillage such as mowing, fertilizing, sowing and also doing nothing.

FIGURE 26 Spring 2019

FIGURE 27 Spring 2021

The work of the first year (Figure 26) consisted of planting young trees in some slopes of the terraces. Most were planted with Groasisboxes. The soil was rock hard at the time; digging a planting hole was almost a day's work. A small part of the terraces was no longer ploughed. Pruning wood was used to cover the soils of the abandoned orchards. The stone barn was renovated and a large cistern was dug by the contractor and his team.

In total (Figure 27), we planted over 1700 trees and shrubs, in rows, groups and in a loose formation. The majority have been planted at the edges of the forest. The trees were purchased from Spanish nurseries, as well as from our own cultivation: fruit trees, various types of oak, forest trees, and a few park trees, mainly local species from both recent and older days. All the terraces are newly sown and we dig more long swales and a small pond.

FIGURE 28 Digging

FIGURE 29 Sowing

FIGURE 30 Drilling

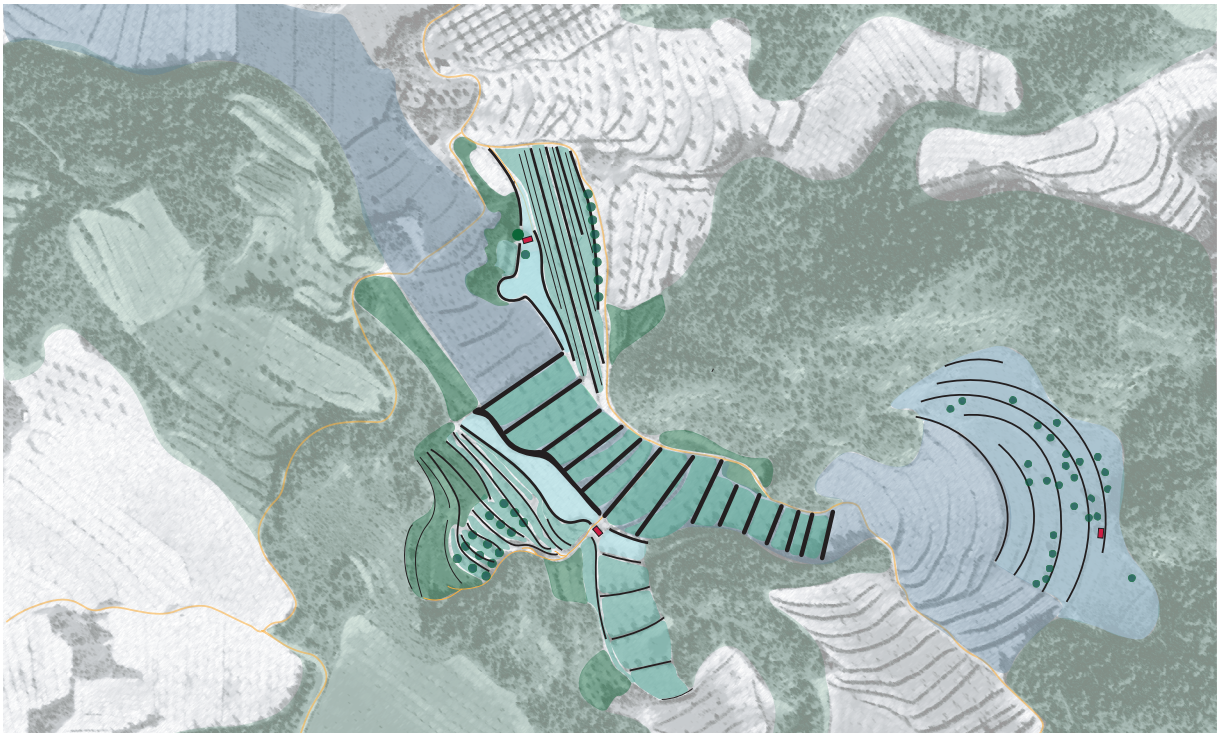

FIGURE 31 Patterns and structures in the valley

Structure

Along the way, the patterns and structures of the terrain and its position in the surrounding environment have come into sight. Patterns and structures shape the character, soul, and identity of this place. We add our own modest, sometimes outspoken, but above all natural layer to the landscape. Characteristic patterns are the elongated stone terraces and the groves with rows of olive trees surrounded by dark wild pine forest. New trees, water courses, and cornfields are added to these old structures. New trees and shrubs are mostly positioned along the edge of the pine forest, amplifying the contrast with the existing olive groves. Circular shapes in the grass, scattered terraces as look-out points and marked footpaths are new, more outspoken ad ditions to the landscape.

Designing

Designing during construction does not mean constantly changing plans. It is more about establishing a robust framework in which the unforeseen can take place. Such a frame creates coherence, beauty, and a connection with the greater whole of the past and the future in space and time.

Lessons Learned

For the last three years, we have lived for regular periods in the valley while working and shaping the land. With enough time on our hands to try, to fail, and to start all over again. Time and space are luxuries and a great asset to understanding the relationship between soil, plants, and water. We have experienced and learned how to work with these ingredients at hand, without importing materials from 'elsewhere.' We have learned to use all our senses more intensively; we can better smell, hear, and feel the land. Over time, we have become more sensitive to understanding where we can seize the moment and when we need to step back and let nature take its course.

It has been challenging to break with our initial instinct to preserve all the smaller parts we learn to love. This sometimes prevents us from making a bigger impact while risking lingering in the details. This conflict, at the same time, forces us to keep our greater goals and strategy in mind and keep on going with robust interventions while avoiding transformations of the landscape that are too drastic.

We've experienced and acquired a deep knowledge of the landscape by 'doing.' While trying out techniques and methods on the spot, you immediately see what might work and what doesn't. By physically engaging with the landscape, you appeal to all your senses, engage more deeply with the local community, and build your intuition and trust. I wish for any designer to be able to leave their desk and computer, and to go outside to build up a physical and emotional relationship with the landscape in which they design.

Future

We are working on the landscape with the awareness that we are only here for a few decades. The approach, the ambitions and also the techniques of our project are familiar to more large-scale and long-term reforestation and regenerative land-building projects that are also being developed in Spain. A more large-scale approach is also conceivable in the landscapes of Guadalope and Matarraña. We explore and investigate how we can contribute to the quality of the landscape on a bigger scale. We are convinced through commitment, love, and attention there will be movement and growth towards a more sustainable biodiverse landscape, sometimes apparent only by talking with our neighbours.

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While this visual essay was in development, Marjolein Hillege was interviewed about the Barranco de Tremps project by the Dutch landscape magazine De Blauwe Kamer (nr. 01 / 2021). Due to this there is some overlap in imagery and content.

Further Information

www.alvelal.net - *this association unites farmers, livestock breeders, businessmen from various sectors, traders, researchers from universities and other institutions to build a more prosperous future, especially for agriculture land in Granada*

www.commonland.com - *Commonland is an organization with a mission to transform degraded landscapes into thriving ecosystems and communities based on sound business cases and aligned with international policies and guidelines*.

www.ecosystemrestorationcamps.org - *Ecosystem Restoration Camps is a global movement of people that is creating an abundant earth by repairing broken ecosystems together.*

www.rewildingeurope.com - *this organization is working in eight large rewilding areas* across Europe, *Their aim is to create large, rewilded landscapes, demonstrating how Rewilding Europe's vision can be put into practice on a far larger scale*.

References

Barrios Ayala, L. (2018). *Evolving Lower Guadiana, Lourdes: a regional strategy for the Bajo Guadiana River Valley. Landscape Regeneration, Sustainable Local Production, Green-Blue Accessibility.* AHK, Amsterdam.

Comarca del Matarraña, universidad de Catalunya, ARC (2010). Carta del Paisaje de la Comarca del Matarraña [Map of the Landscape of the Matarraña Region].

Götsch, E. www.agendagotsch.com; www.lifeinsyntropy.org

Holzer, S. (2012). *Desert or Paradise: Restoring endangered Landscapes Using Water Management, Including Lakes and Pond Construction.* Chelsea Green Publishing.

Jarman, D. & Sooley, H. (1995). *Derek Jarman's garden, a record of an evolving garden in a desolate area.* Thames and Hudson.

Molinson, B. (1988). *Permaculture, a designer's manual: References and advice to create and design sustainable systems.* Ten Speed pr.

Raxworthy, J. (2018). *Overgrown: practices between landscape architecture and gardening.* MIT Press.