

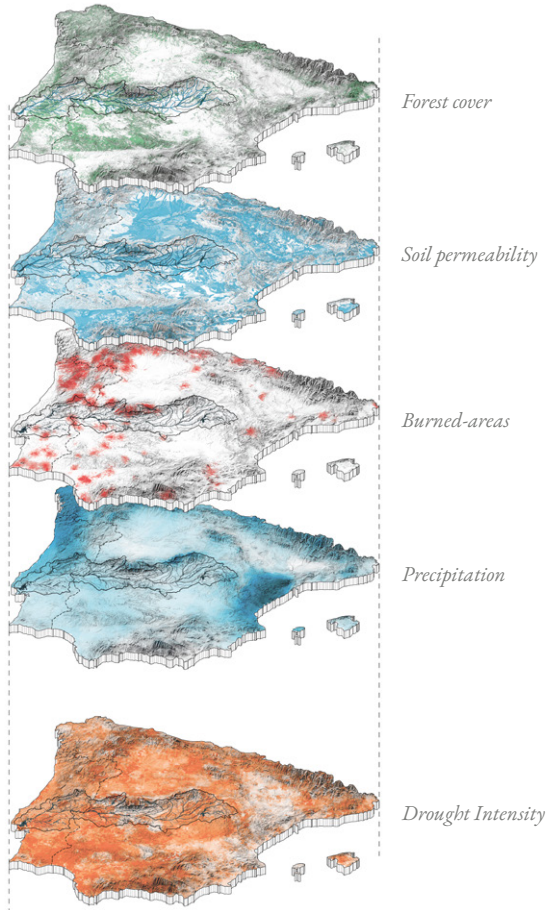


Guide to the Water-Landscape Commons

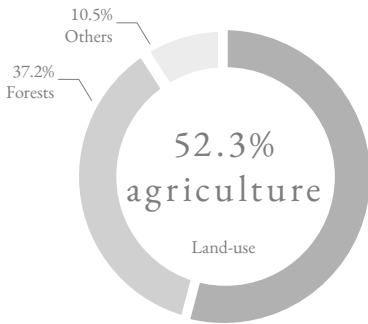
Arganda del Rey

*Why do we need
the commons?*



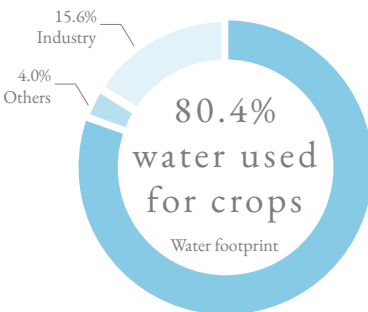


The Need For A Collaborative System in Today's Climate



In the advent of today's climate crisis, water scarcity in Spain has become more severe than it has ever been. Such an extensive problem cannot be alleviated by a person alone, but together as a community, we can help make things better.

Groundwater levels are dropping quicker every year due to the rising global temperatures, leaving little for farmers to water their crops. Moreover, monospecific agriculture, practiced by many farmers throughout the country, has contributed to the low vegetation regeneration and hardening of soil. This makes the ground less porous and permeable for water infiltration.



How Can the Community Collaborate in These Trying Times?

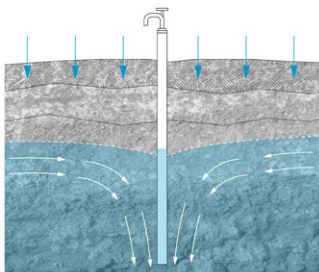
What we can do as a community is to organise water-landscape commons, a community-owned pool of resources that everyone collaborates to help restore the landscape's conditions for the benefit of everyone.

The Current Situation Of The Irrigation System And Water-Landscapes

Most water sources in Spain are often large water bodies, such as rivers, lakes and canals, or groundwater. However, with today's extreme evaporation, most farming communities are now switching to more efficient modes of irrigation.

1. Localised Irrigation
2. Drip Irrigation
3. Sprinkler Systems

These types of irrigation reduce wasted water compared to surface irrigation, which undergoes high evaporation due to the high surface exposure to the extreme heat. This can help relieve some strain on groundwater sources to some extent.



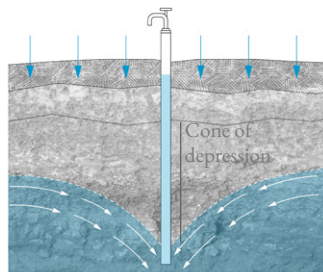
Regular water extraction from extraction wells

However, with the increasing trends of global warming, the water bodies and groundwater are susceptible to excessive water loss from evaporation.

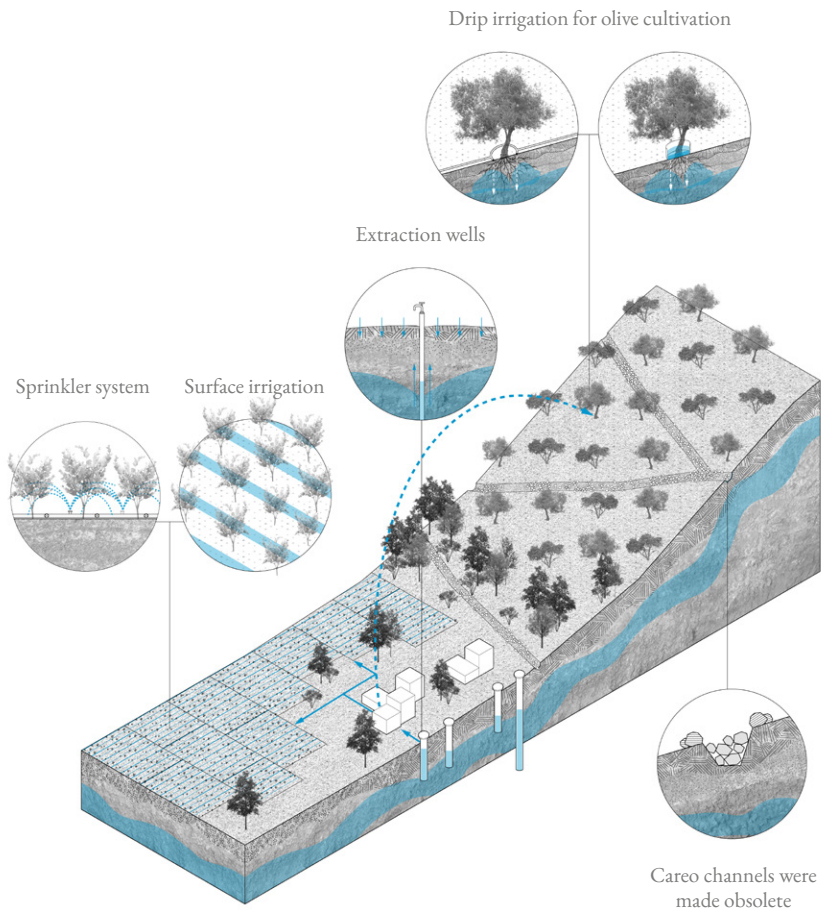
Over the past year, there have also been unregulated wells and over-extraction of groundwater, harming the aquifers across the country and depriving other users of their share of the clean water. This has put a strain on the farming community as many croplands produce lower yields. Some farms are also struggling to make ends meet.

Additionally, with agriculture dominating the land-use of the country, forests cover less than 40%. This has contributed to the excess water loss from the ground, rivers and lakes during dry seasons. Some areas even experience perpetual low water tables levels, and these places are at risk of desertification.

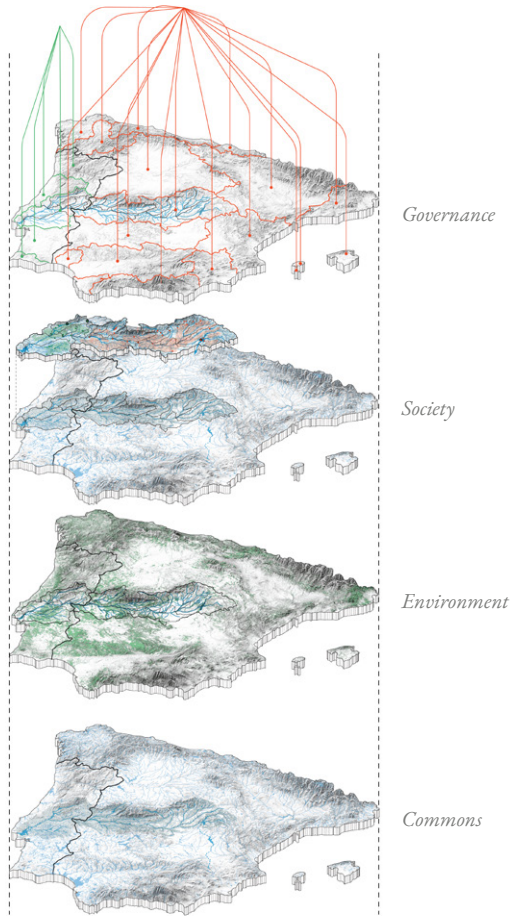
If water becomes part of a common pool of resources, every member of the community will be responsible for each other and their livelihoods. This could help foster a collaborative system between the environment, society's needs and community-driven resource governance.



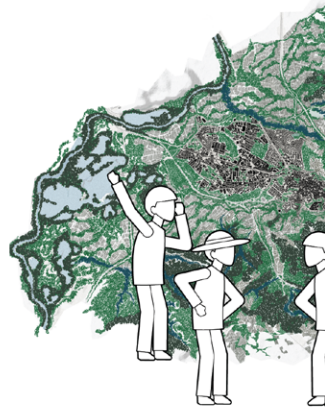
Illegal / over-extraction from aquifers



Existing modes of irrigation



*What does it mean
to establish the
commons?*

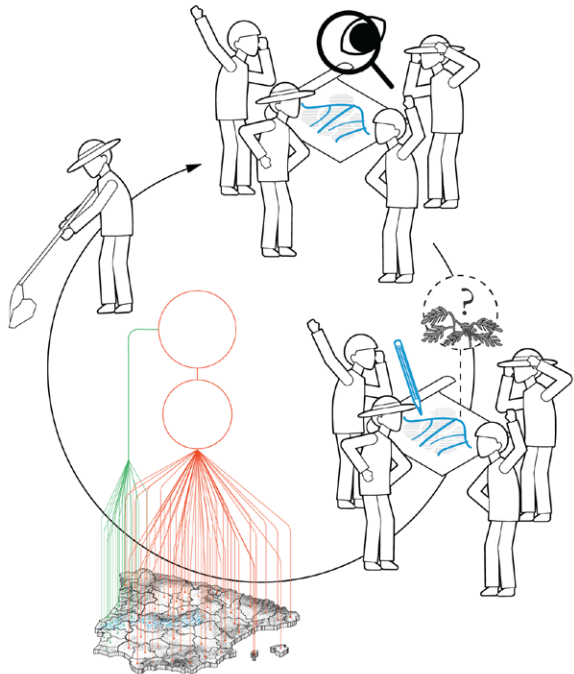


Graduated sanctions:

violators of the rules will be assessed by other users of the commons or officials that are accountable to the users.

Monitoring and conflict-resolution system:

monitors will actively track the conditions of the commons who either report to the users or are users themselves. Also an efficient and accessible way to raise conflicts between users, stakeholders or changes to the environment.

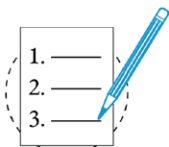




Clearly defined boundaries:

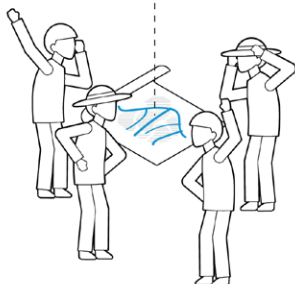
what the resources are and who have the rights to partake

Principles That Form The Basis Of The Commons



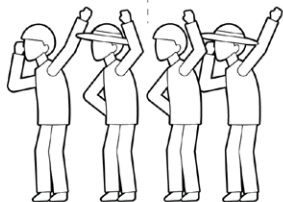
Congruence between appropriation and provision rules and local conditions:

Agreement and organisation of the rules of the commons and the partial commons



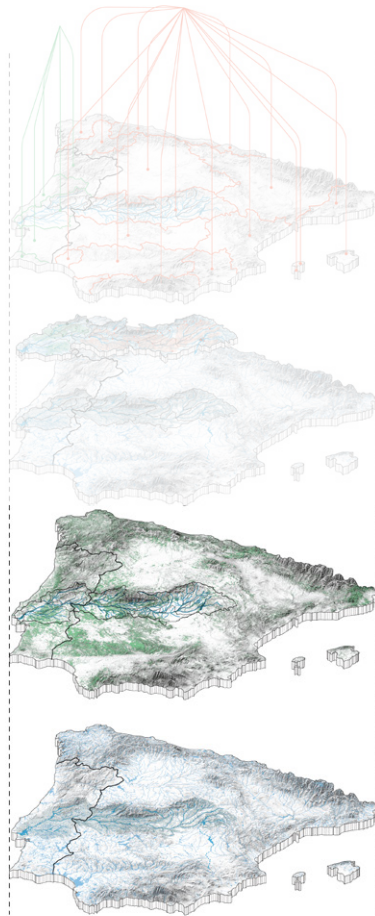
Collective-choice arrangements:

individuals participating in the commons can collaborate to form or change the rules that are mutually agreed upon



Minimal recognition of rights to organise:

users have rights to plan their institutions without rights being challenged by external forces.



Environment

Commons

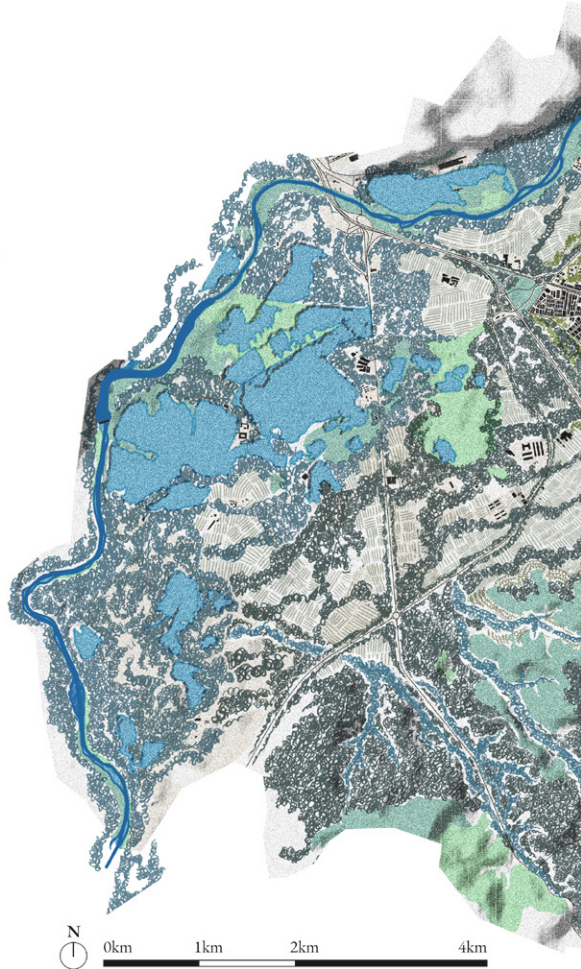
*What is part of the
water-landscape
commons?*

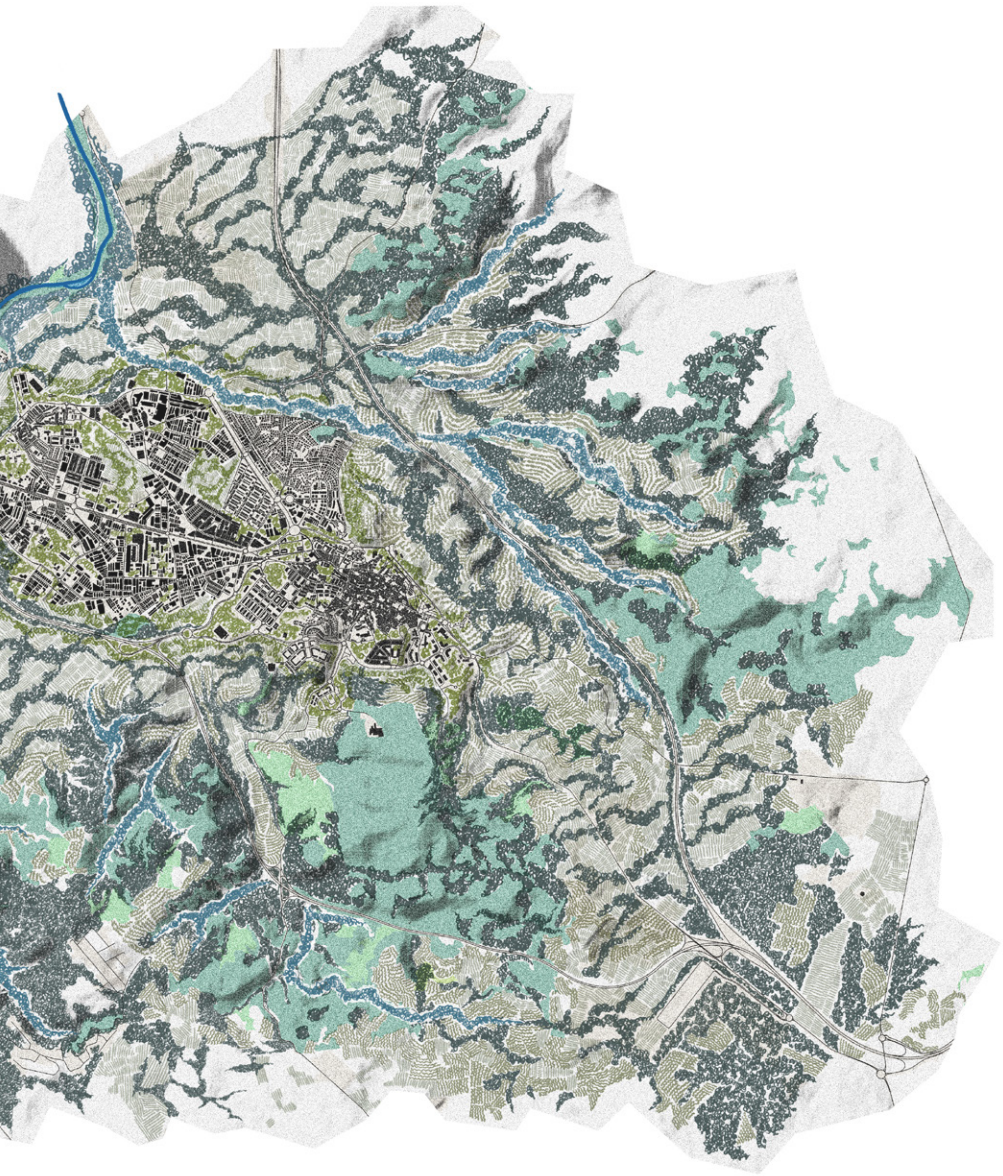
New Vision for Arganda Del Rey

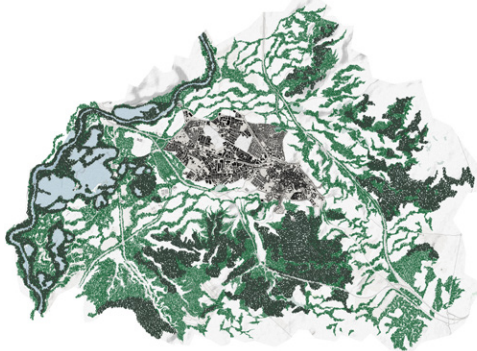
-  Brook and ravine habitats
-  New riparian forests
-  New forests
-  New urban landscapes
-  New crop land / vineyards
-  New tree-crop land
-  Existing forests
-  Existing sparse forests
-  Existing sparse trees
-  Existing crops / barren land
-  Water bodies
-  River / tributaries

The water-landscape commons is the community-owned space of cultural and natural resources that are accessible to each member of the community. As a member of the community, you have some basic rights to use the common pool resources in exchange for maintaining them. This would involve a set of rules and values to adhere to in order to protect the resources, cultural practices and those partaking in the commons. The commons is not governed by a state or market but rather the community of users.

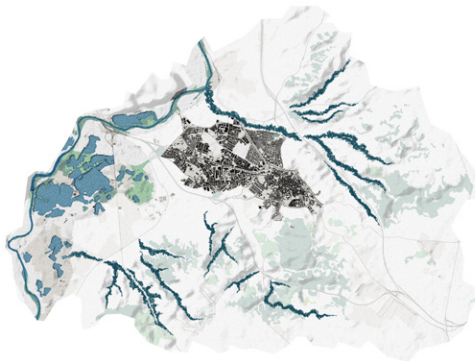
People have different stakes in the commons and some are more vulnerable than others. The farming community, for instance, depend on the Tagus River's water to irrigate their crops. If you are a farmer, you can help participate in the organisation of the commons. Depending on your level of participation, you will then have the rights to reap the harvests and water from the commons.







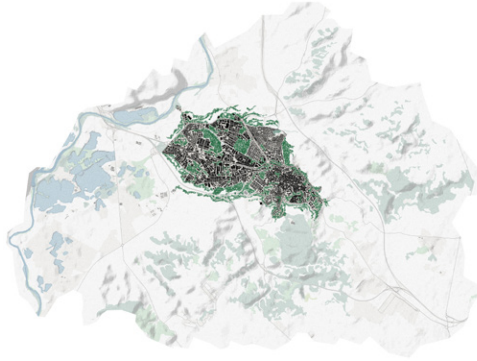
Protected Forests and Agroforests



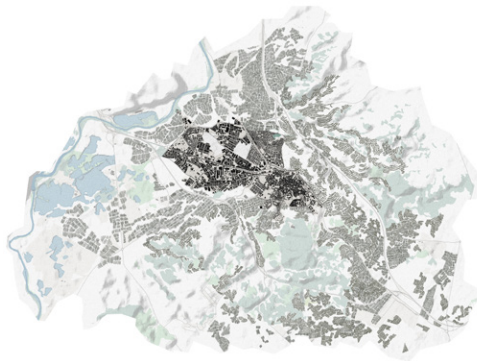
Brook and Ravine Habitats

The Agricultural Commons:

Protected forests, agroforests, brooks and ravines



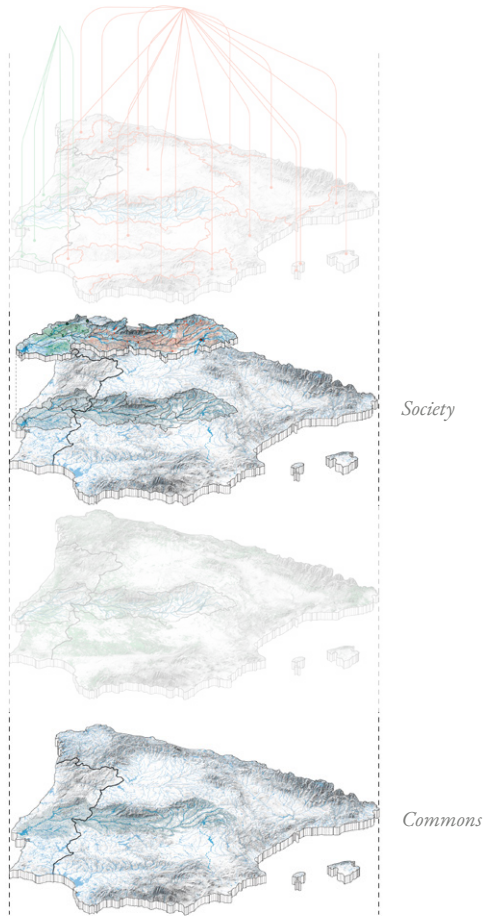
Public Green Spaces



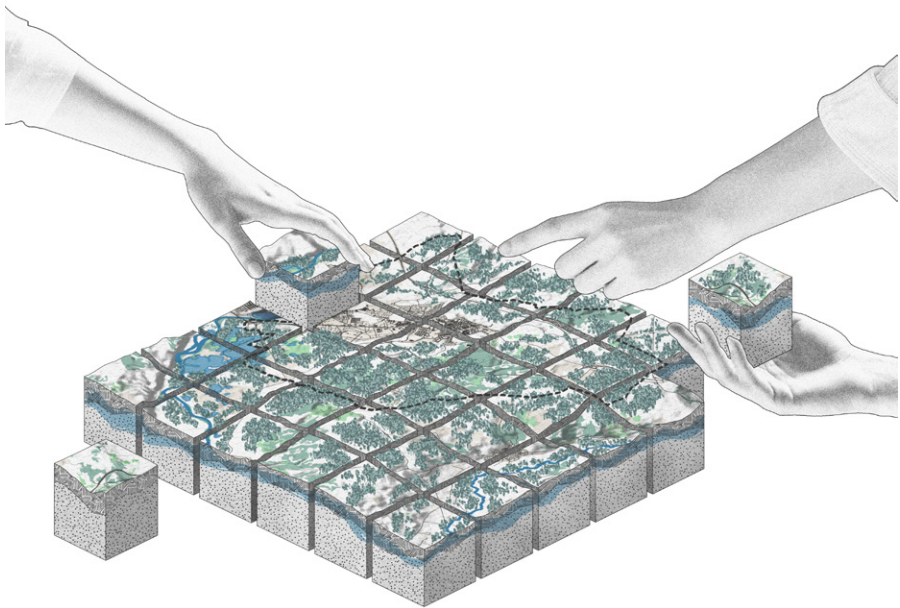
Private-owned Cropland as the Partial Commons and Cultural Landscapes

The Partial Commons:

Public Spaces and Private Cropland

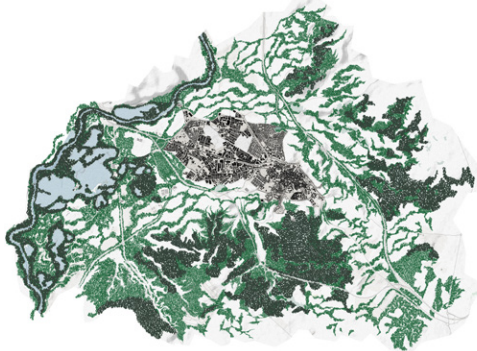


*Who can use the
commons?*

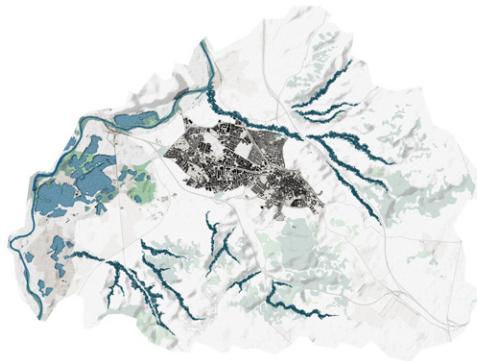




Collaboration Between Stakeholders



Protected Forests and Agroforests



Brook and Ravine Habitats

The Agricultural Commons:

Protected forests, agroforests, brooks and ravines

Agroforests

Farmers participating in the commons only

Protected Forests & Nature Reserves

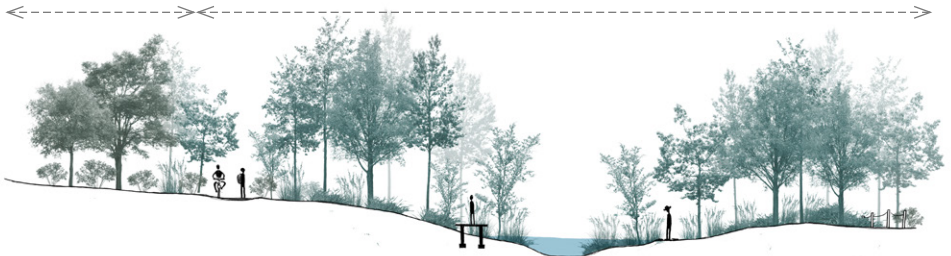
Members of the public and community can enjoy the outdoors but not stray from paths



Protected Forests & Nature Reserves

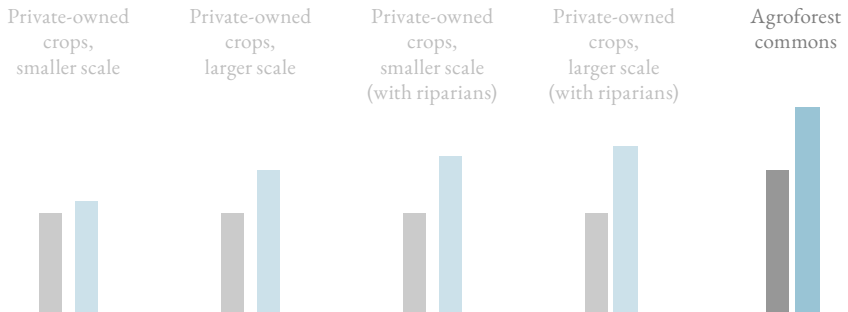
Members of the public and community can enjoy the outdoors but not stray from paths.
Farmers can use amounts of water depending on their participation in the commons

Brooks & Ravines



Levels of Accessibility

How much water and compensation can you get?



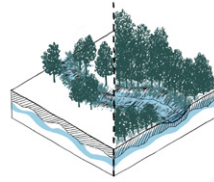
Compensation & access to water from natural sources according to scale of business and level of participation in the commons

What Are The Recommended Rules Of The Agricultural Commons?

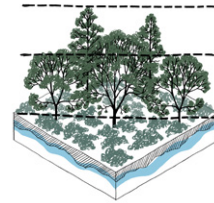
These are recommended rules of the commons to start off. Members of the community and those who have the rights to partake in the commons (ie. farmers) can come together to discuss these terms and reorganise the rules and values necessary to establish a sustainable and collaborative system to manage natural resources and preserve cultural agriculture customs.

The commons will consist of the expanded forest cover, existing forest land and the rivers, brooks and ravine systems that are connected by them. Forest cover expansions connect existing forest land to the river, brooks and ravines, they can be done by encouraging some farmers to adopt agroforestry or a polyculture of trees and other crops on their land.

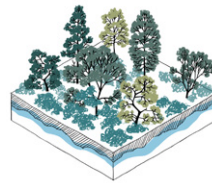
1. Agroforests will become common land, where farmers will be able to harvest from any part of these forests within a stipulated limit.
2. An encouraged limit on the amount of wood that can be harvested by each person in the community.
3. Ensure forest layers by including understory and shrubs / groundcover layers among crop trees.
4. Alternatively, farmers can involve crop diversification with less pressure to provide vegetation layering.
5. Harvesting of wood resources will be done mechanically and regular maintenance will be done using approved sustainable methods.
6. Brooks, ravines and existing forests will be preserved and maintained.
7. Farmers of agroforests will be able to use the water from the protected brooks and ravines.



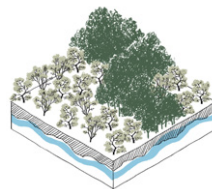
Expanding existing brooks or ravines



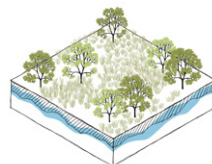
Adding layers to vegetation



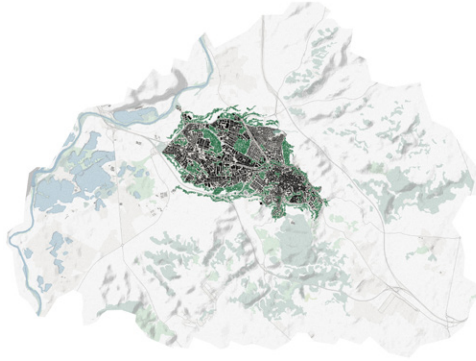
Diversifying vegetation



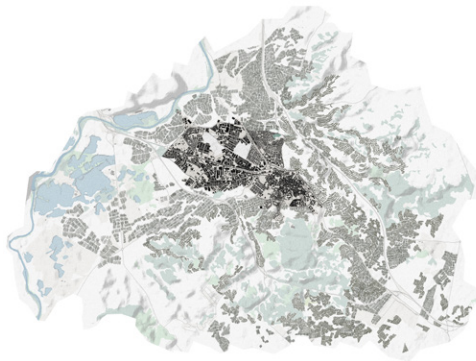
Connecting forests to cropland



Adopting crop rotations



Public Green Spaces



Private-owned Cropland as the Partial Commons and Cultural Landscapes

The Partial Commons:

Public Spaces and Private Cropland

Parks (Public Green Spaces)

All members of the
Community can access

Protected Forests & Nature Reserves

Members of the public and community can
enjoy the outdoors but not stray from paths

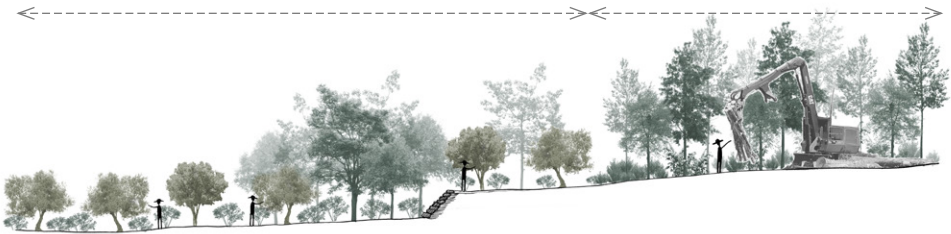


Private-owned Cropland

Farmers or owners of the
land only

Agroforests

Farmers participating in the
commons only



Levels of Accessibility

How much water and compensation can you get?



Private-owned
crops,
smaller scale



Private-owned
crops,
larger scale



Private-owned
crops,
smaller scale
(with riparians)



Private-owned
crops,
larger scale
(with riparians)



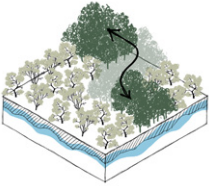
Agroforest
commons



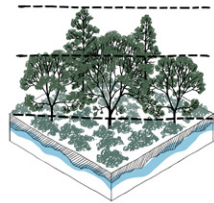
Compensation & access to water from natural sources according to scale of business and level of participation in the commons



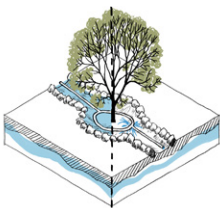
Connecting public greenspaces to forests and other cropland



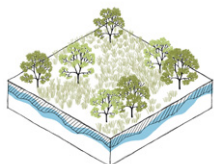
Connecting small forests



Adding layers to vegetation



Different seasonal irrigation methods



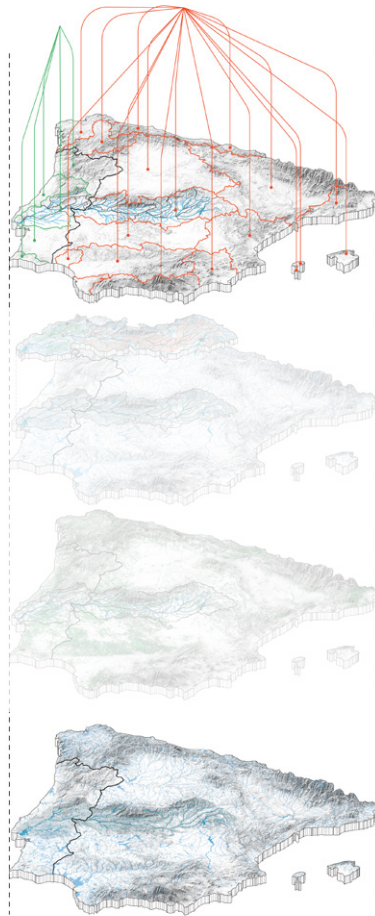
Adopting crop rotations

What are the Recommended Rules of the Partial Commons?

The initial phases of establishing the commons will be gradual and full participation of the farming community is not expected due to the lasting cultural traditions and affordability of joining the commons. The remaining cultivated private land will become a part of the landscape as a representation of traditional local cultivation. Under this arrangement, landowners will be protected and recommended to employ eco-schemes from the Common Agriculture Policy in exchange for using water from rivers and streams from enhanced brooks and ravines to some extent and other financial assistance.

1. Part of the cultivated land will be encouraged to be devoted to sustainable non-productive uses, for example, forest growing.
2. Farmers should practice crop rotations or land-sparing across the land area they own.
3. Use of vegetation layering together with crops.
4. Use of approved seasonal irrigation rotations. During wet seasons, farmers will use traditional acequias – a variety of traditional Spanish irrigation methods – to gather water from rainfall and route them to irrigate crops. During dry seasons, more mechanical means such as drip / localised irrigation should be used to reduce water consumption.
5. Farmers can draw a limited amount of water from the ravines and brooks, proportional to the size of their agricultural businesses.

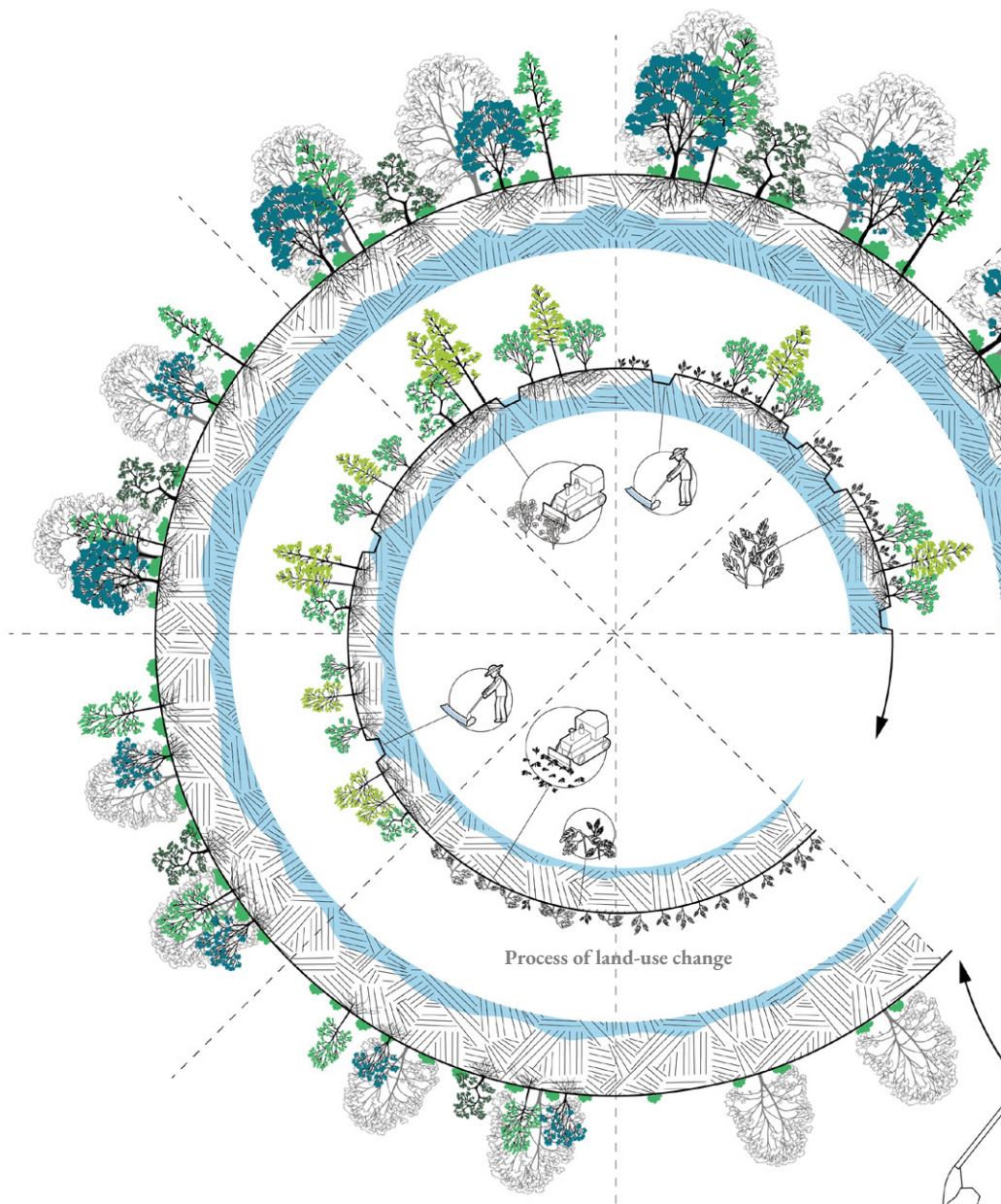
Farmers can collaborate with local organisations that specialise in afforestation to begin growing small forest habitats on their land. Procurement of seedlings, saplings and other material will be subsidised. Furthermore, the initial phases of establishing the commons should provide farmers with compensation for forest growing and even tax reliefs to encourage participation of the farmers and reduce the barrier of entry.



Government

Commons

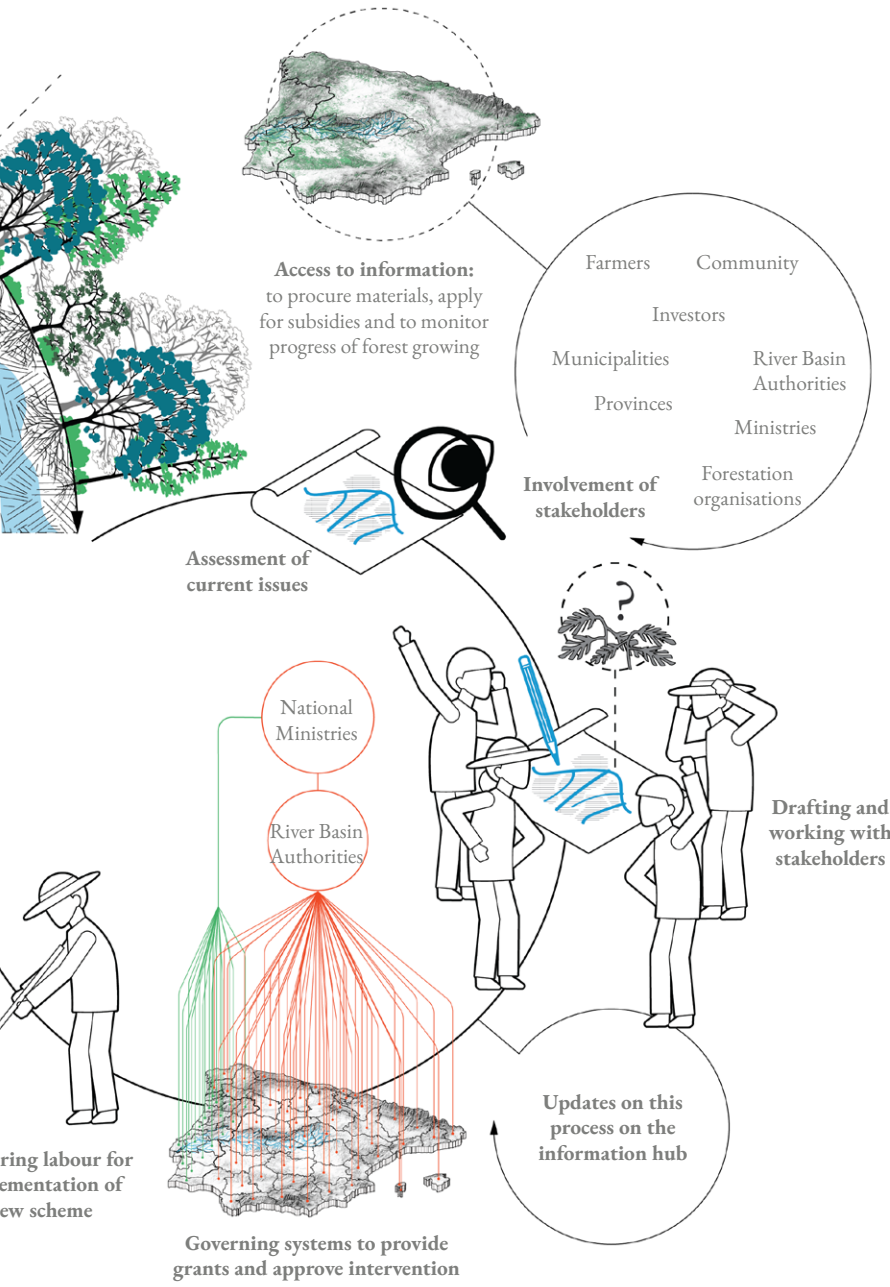
*How can the
commons be
managed?*



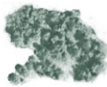
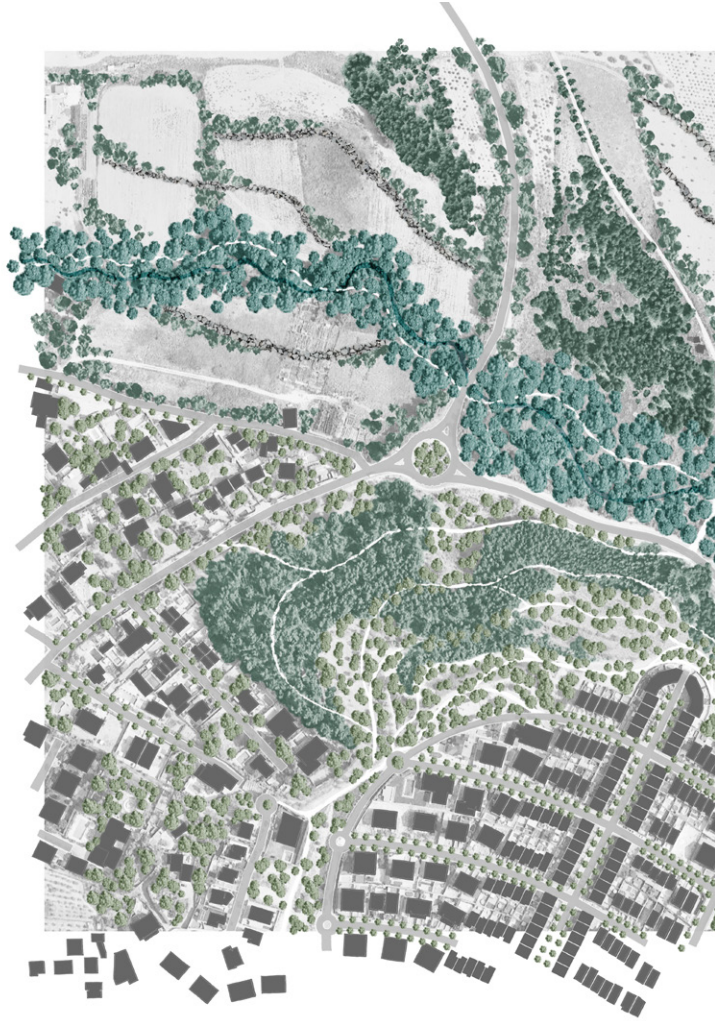
Process of land-use change

Monitoring the process of
afforestation and protected forests

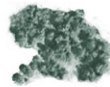
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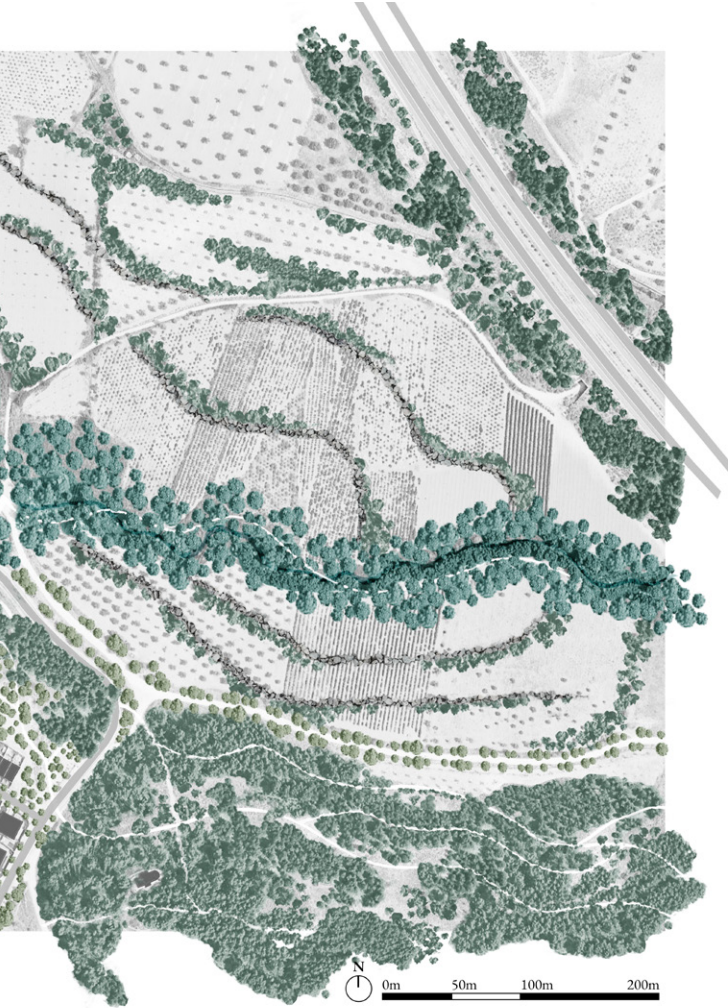
*Why should
these places
become public
spaces?*



Protected forests
/ nature reserves



Protected forests
/ nature reserves



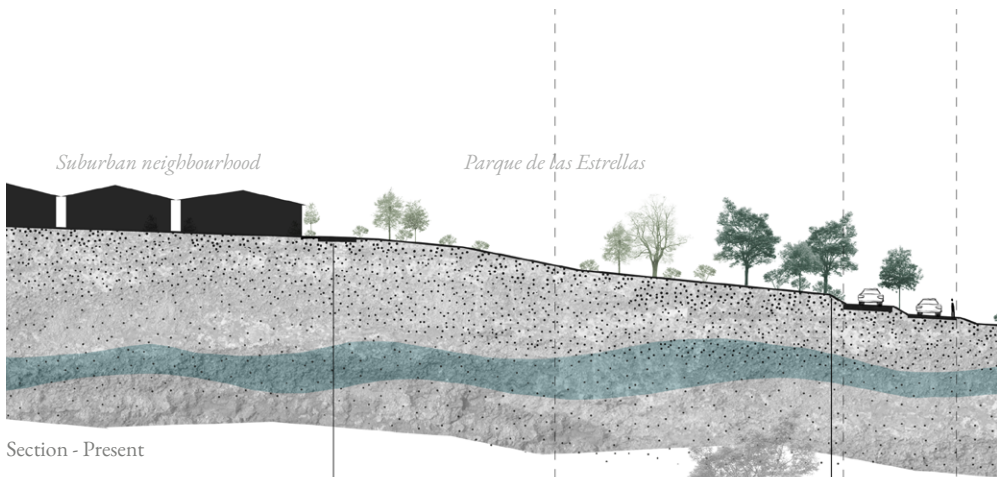
*Because the
community can
bring value to
the land and
bring life back
to the soil.*



Riparian forests of
Arroyo del Vilches

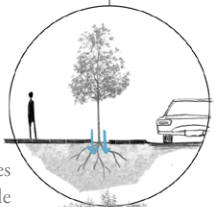


Parks and Urban
Green Spaces

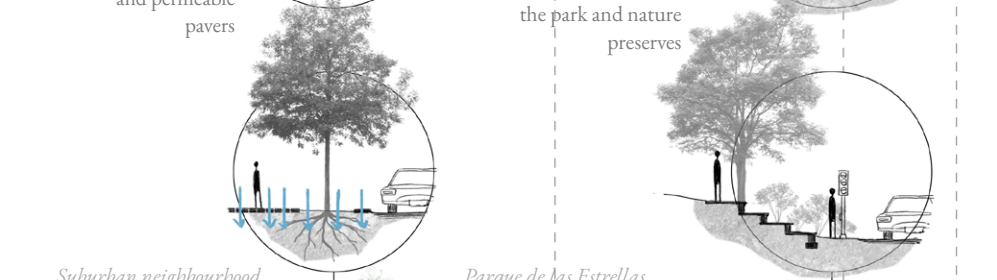
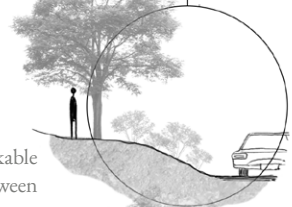


Section - Present

Wider tree canopies and permeable pavers

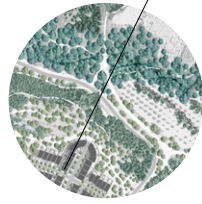


Creating a walkable connection between the park and nature preserves



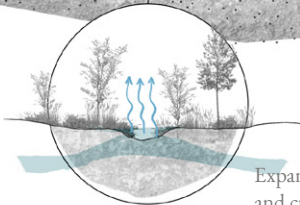
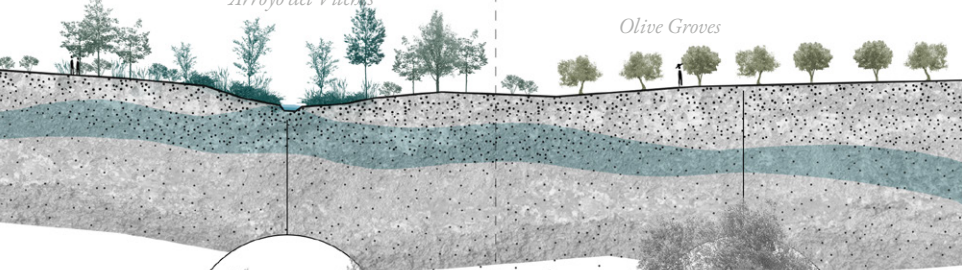
Section - After intervention

0m 50m 100m 200m

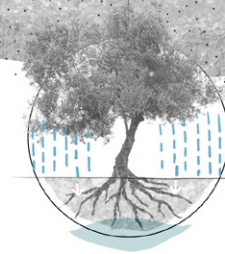


Arroyo del Vilches

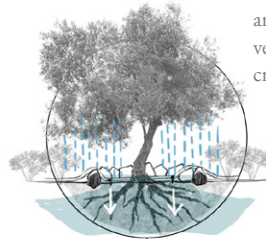
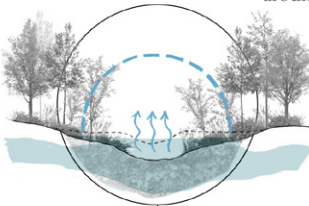
Olive Groves



Expanding the arroyos and creating riparian vegetation habitats around them

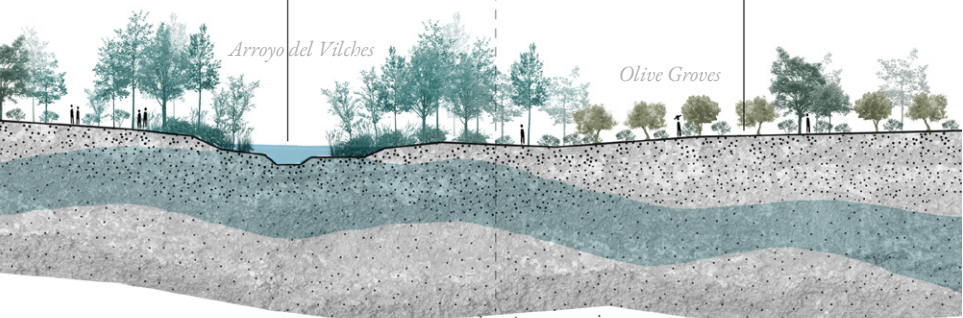


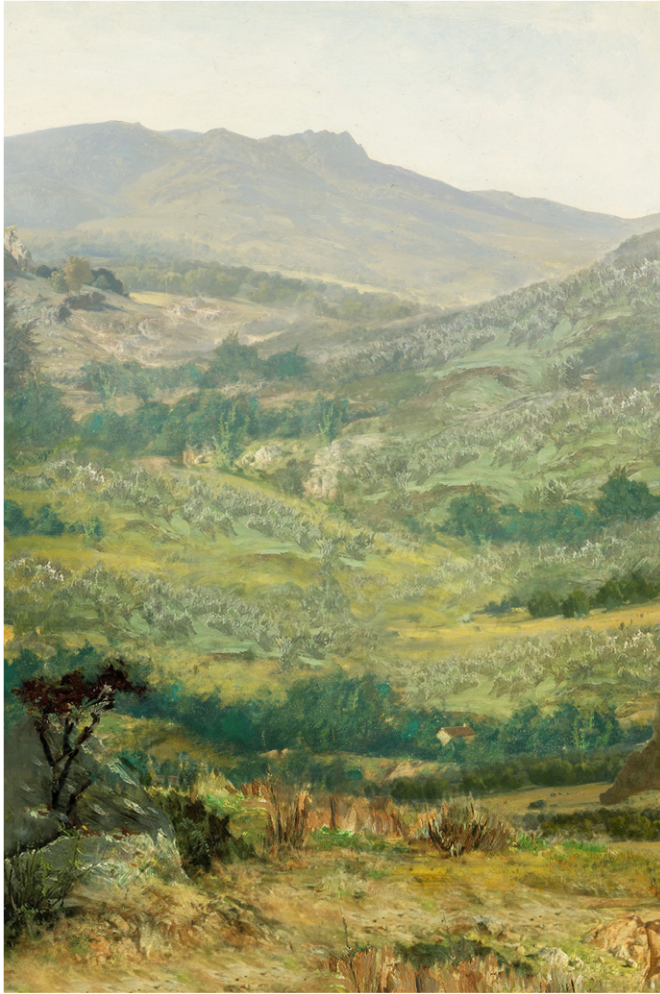
Encourage land-sharing, crop rotations and layered vegetation on cropland

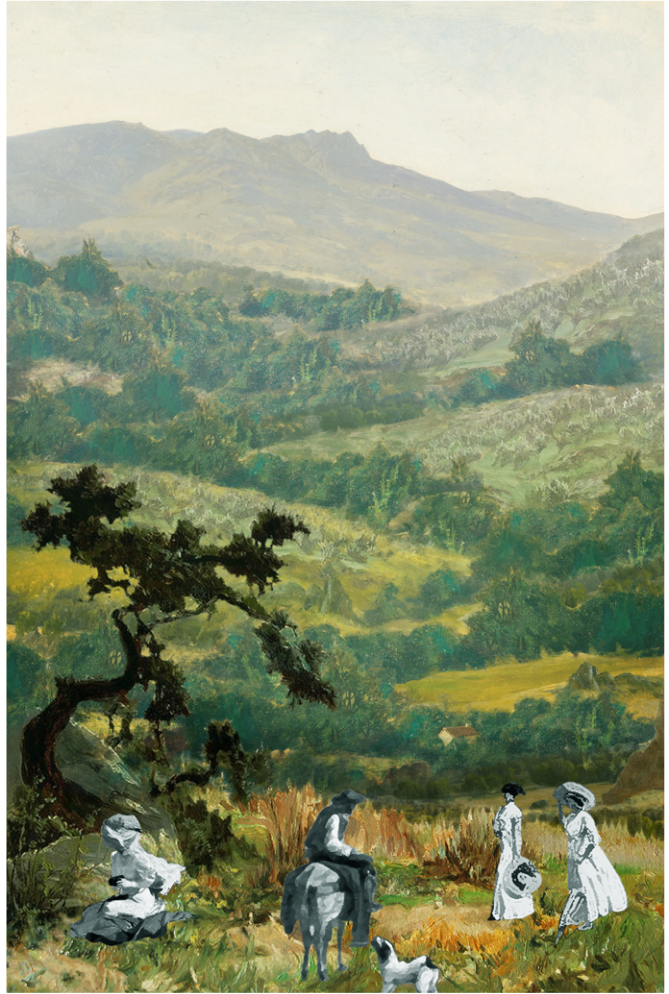


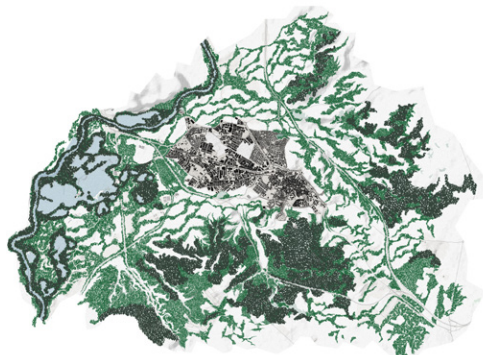
Arroyo del Vilches

Olive Groves

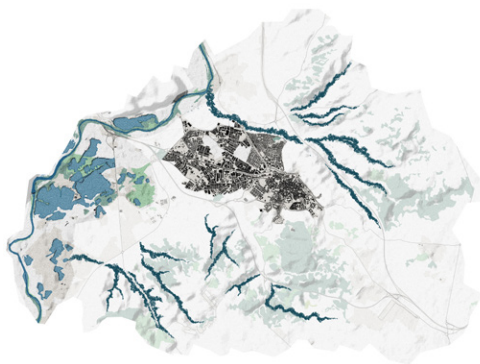








Protected Forests and Agroforests



Brook and Ravine Habitats

The Agricultural Commons:

Protected forests, agroforests, brooks and ravines

*How can we
start growing
agroforests?*

Partaking in the Agricultural Commons: A Guide to Growing Agroforests

If you are a farmer and you would like to be a contributing part of the water-landscape commons by adopting agroforestry, you can approach the AGFE (Spanish Agroforestry Association) or grow your economic / ecological forests on your own. Whether you are growing forests with help or by yourself, you may apply for some subsidies for the necessary materials and process by visiting the website.

If you are interested in growing these economic forests yourself, there are some steps you can take to achieve this.

1. Consideration Climate, Soil and Native Plant Species

Climate Assessment

Some areas of Central Spain, such as the Community of Madrid and including Arganda del Rey, are semi-arid. Dry summers are experienced throughout the region.

Type of soil and minerals present

The geological map of Arganda details what types of soils are naturally present in your plot of land and around it. Most crops present are grown on clay type soils that are variations of marls, carbonates, gypsum, mixed with sandy type soils.

Native vegetation present

It is important to assess which species are native and non-native. For instance, some species like the Holm Oak are now rare in the landscapes of Arganda due to the changing climates. Knowing this information will guide you on which species are appropriate to introduce in your forests.



Quercus ilex
"Holm Oak"
Native



Pinus sylvestris
"Scots Pine"
Non-native



Quercus canariensis
"Zeán Oak"
Native



Olea europaea
"Olive"
Native



Linum suffruticosum
"White Flax"
Native



Antirrhinum graniticum
"Spanish Snapdragon"
Native



Stipa tenacissima
"Esparto Grass"
Native



Malva multiflora
"Cretan mallow"
Native

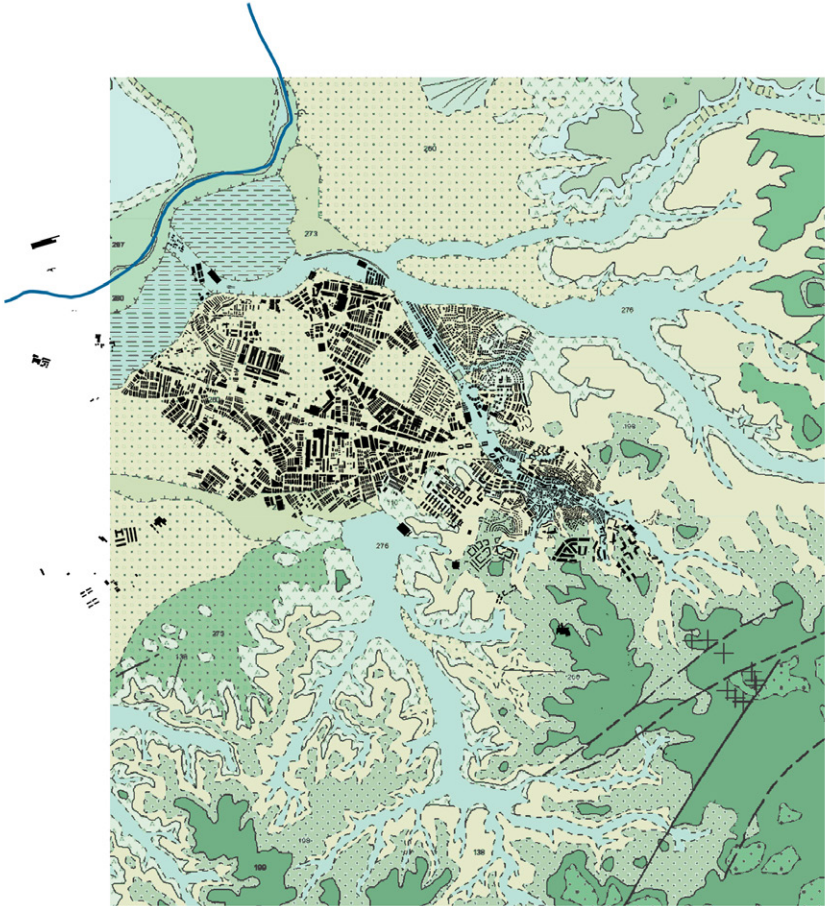


Ecbium vulgare
"Viper's Bugloss"
Native



Hirschfeldia incana
"Mediterranean Mustard"
Native

What species are present in Arganda today?



*What kind of trees can
be planted in Arganda?*



More information on the Catalogue of Base
Materials, on the Ministerio para la Transición
Ecológica y el Reto Demográfico website.

National Catalogue Of Base Materials For The Production Of Identified Forest Reproductive Material

Abies alba Mill.
Abies pinsapo Boiss.
Acer platanoides L.
Acer pseudoplatanus L.
Alnus glutinosa (L.) Gaertn.
Arbutus canariensis Veill.
Arbutus unedo L.
Betula pendula Roth
Betula pubescens Ehrh.
Carpinus betulus L.
Castanea sativa Mill.
Fagus sylvatica L.
Fraxinus angustifolia Vahl.
Fraxinus excelsior L.
Ilex aquifolium L.
Juglans nigra L.
Juglans regia L.
Juniperus communis L.
Juniperus oxycedrus L.
Juniperus phoenicea L.
Juniperus thurifera L.
Larix decidua Mill.
Larix kaempferi Carr.
Olea europaea Brot.
Phoenix canariensis Hort.
Picea sitchensis Carr.
Pinus canariensis Chr. Sm. ex DC.
Pinus halepensis Mill.
Pinus nigra subsp. nigra Arn.
Pinus nigra subsp. salzmannii (Dunal) Franco
Pinus nigra var. corsicana Arn.
Pinus pinaster Ait.

Pinus pinea L.
Pinus radiata D. Don
Pinus sylvestris L.
Pinus uncinata Mill.
Pistacia atlantica Desf.
Populus alba L.*
Populus x canescens (Aiton) Sm.*
Populus nigra L.*
Populus tremula L.*
Prunus avium L.*
Pseudotsuga menziessii Franco
Quercus canariensis Willd.
Quercus coccifera L.
Quercus faginea Lam.
Quercus ilex L.
Quercus petraea Liebl.
Quercus pubescens Willd.
Quercus pyrenaica Willd.
Quercus robur L.
Quercus rubra L.
Quercus suber L.
Robinia pseudoacacia L.
Sorbus aria Crantz.
Sorbus aucuparia L.
Tamarix gallica L.
Taxus baccata L.
Tetraclinis articulata Masters
Tilia cordata Mill.
Tilia platyphyllos Scop.
Ulmus glabra Huds.
Ulmus minor Mill.

**Populus spp. generally have extensive root systems that may become invasive and dominate water systems. Diversify your populus crops with other species and maintain their population.*



Dehesa

In Dehesa is a low-density oak forests to produce acorns for rearing livestock and to shelter the land from the intense heat during dry seasons.



2. Soil Preparation For Low-Nutrient Soils

Do you have trouble growing crops or has your land been bare for the last few years? The land you are working on may be low on nutrients. Fertilisation of the soil is imperative to support any form of plant life. There are a few options for you to treat your soil before planting:

- *Remove invasive species or unsuitable plants:* there are some species of plants that will out-compete your crops, so it's essential to remove these invasive species. You may refer to the National Catalogue of Invasive Exotic Species.
- *Inorganic fertilisation,* depending on your crop: ammonium sulfates, ammonium nitrosulfates, ammonium nitrates, urea, nitrogen solutions, other nitrogenous solutions.
- *Organic fertilisation:* manure, compost, etc. Adding manure to the surface of the soil is less efficient and its effects would not last. Hence, mixing them at subsoil layers would be more beneficial.
- *Adding a mulch layer* could help with water retention in drought conditions during dry seasons. Having this layer of organic material can help regulate the temperature of the soils and keep the water from being lost unnecessarily to evaporation.



Acacia dealbata
"Silver Wattle"
Non-native, Invasive



Agave americana
"Century Plant"
Non-native, Invasive



Ambrosia artemisiifolia
"Ragweed"
Non-native, Invasive



Cortaderia spp.
"Pampas grass"
Non-native, Invasive



Pennisetum setaceum
"Fountain Grass"
Non-native, Invasive



Senecio inaequidens
"Narrow-leaved Ragwort"
Non-native, Invasive



Heracleum mantegazzianum
"Giant Hogweed"
Non-native, Invasive

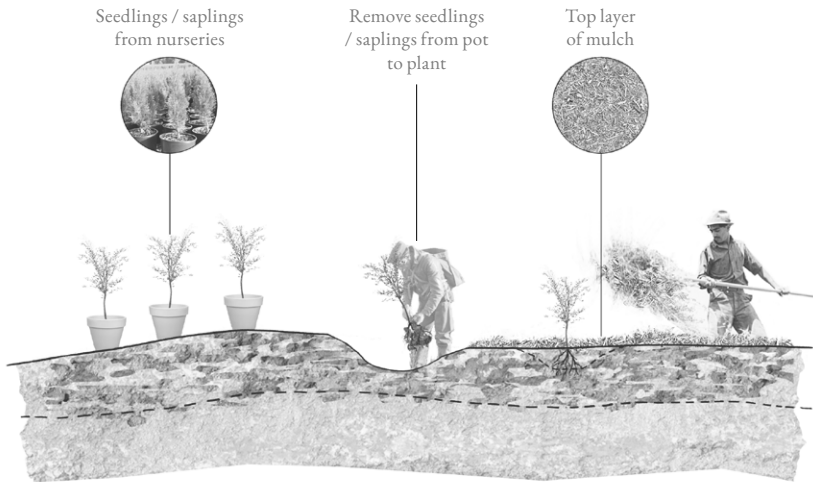
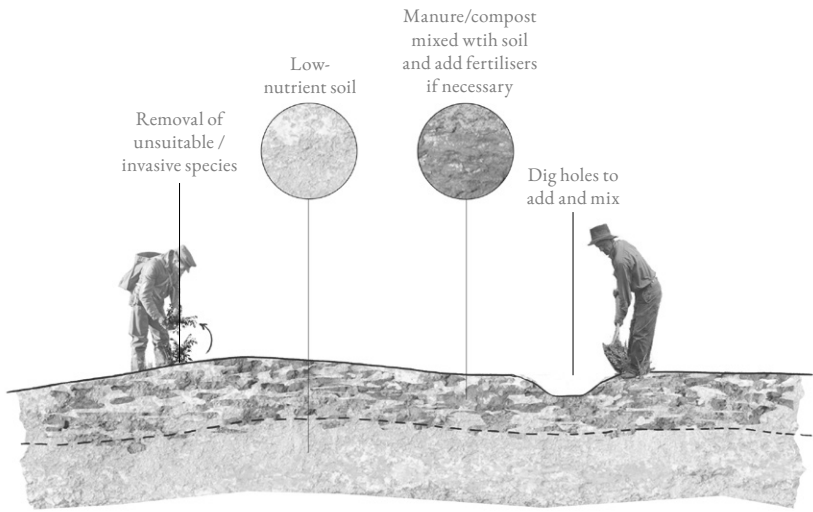


Baccharis halimifolia
"Sea Myrtle"
Non-native, Invasive

3. Growing The Selected Vegetation

Most landscape restoration projects span several years. This process often involves growing trees first in nurseries. The afforestation of arid and semi-arid areas across the world began in a controlled environment, such as greenhouses and nurseries, to germinate seeds before transplanting them as saplings to the site. At this point, the land should have undergone soil preparation for new saplings.

More information on the Catalogue of Invasive Exotic Species, on the Ministerio para la Transición Ecológica y el Reto Demográfico website.



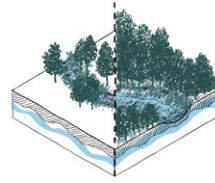
4. Establishing Water Management

There are mechanical methods of irrigation and traditional low-tech methods practiced today to irrigate tree crops. More sparse types of agroforests, where tree numbers are lower, are often irrigated by mechanical means such as drip or localized irrigation. These can be costly for denser types of agroforests, or forests with a higher tree count.

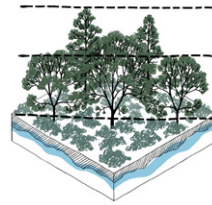
Alternatively, there are traditional methods used since centuries ago to irrigate tree crops and retain water.

There are existing terraces that outline the contours of the slopes around Arganda. These are ways to slow water flowing down the slopes so that more seep into the soil instead of running off.

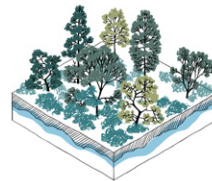
Pits, made of rocks around the base of trees, are also often constructed to catch water during wet seasons to allow precipitation to infiltrate the soil easily.



Expanding existing brooks or ravines



Adding layers to forest vegetation



Diversifying forest vegetation

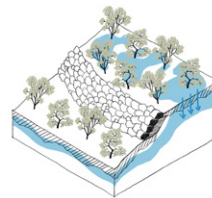
5. Re-Establishing Vegetation Cover

Some spatial principles, when it comes to sustaining a forest, are essential.

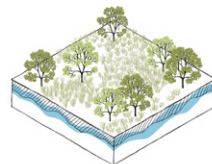
Agroforest lands should be connected for efficient water retention and irrigation.

Agroforests should have a multi-layered structure. In order to maintain the porosity and nutrients in the soil, a shallow root system of perennial native shrubs around the tree crops should be established ideally. However, there are also other alternatives.

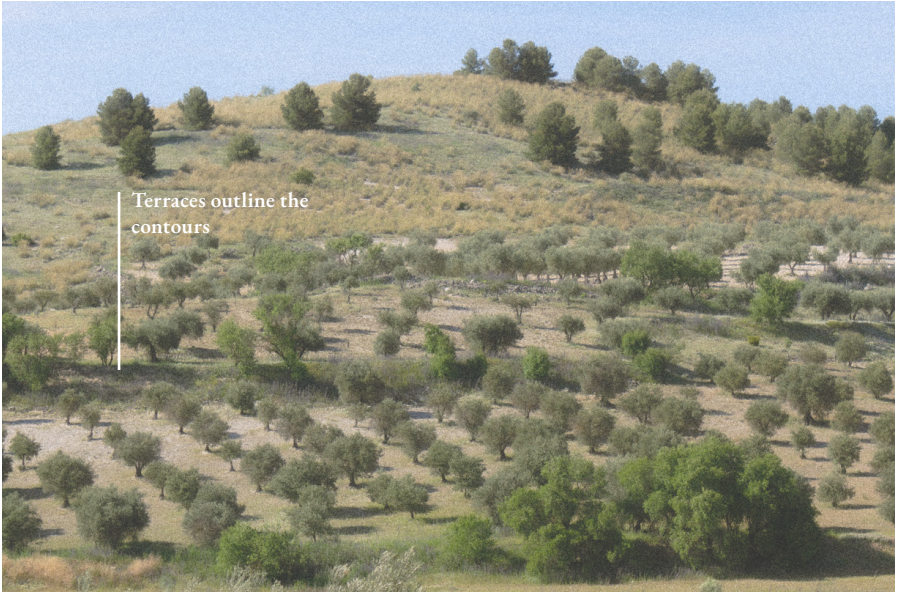
Planted shrubs can also be smaller crops such as wheat or barley. These smaller crops are often not perennial and would require dedication to replant the same crops according to a strict timeline annually.



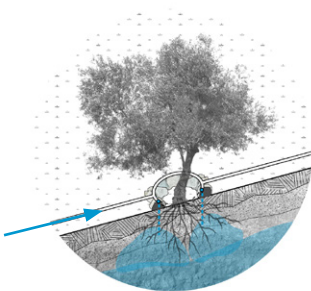
Use of terracing on hilly terrain to retain water



Adopting crop rotations



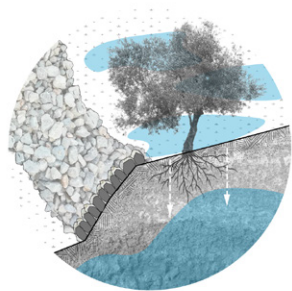
Terraces outline the contours



Drip irrigation with water from brooks and ravines

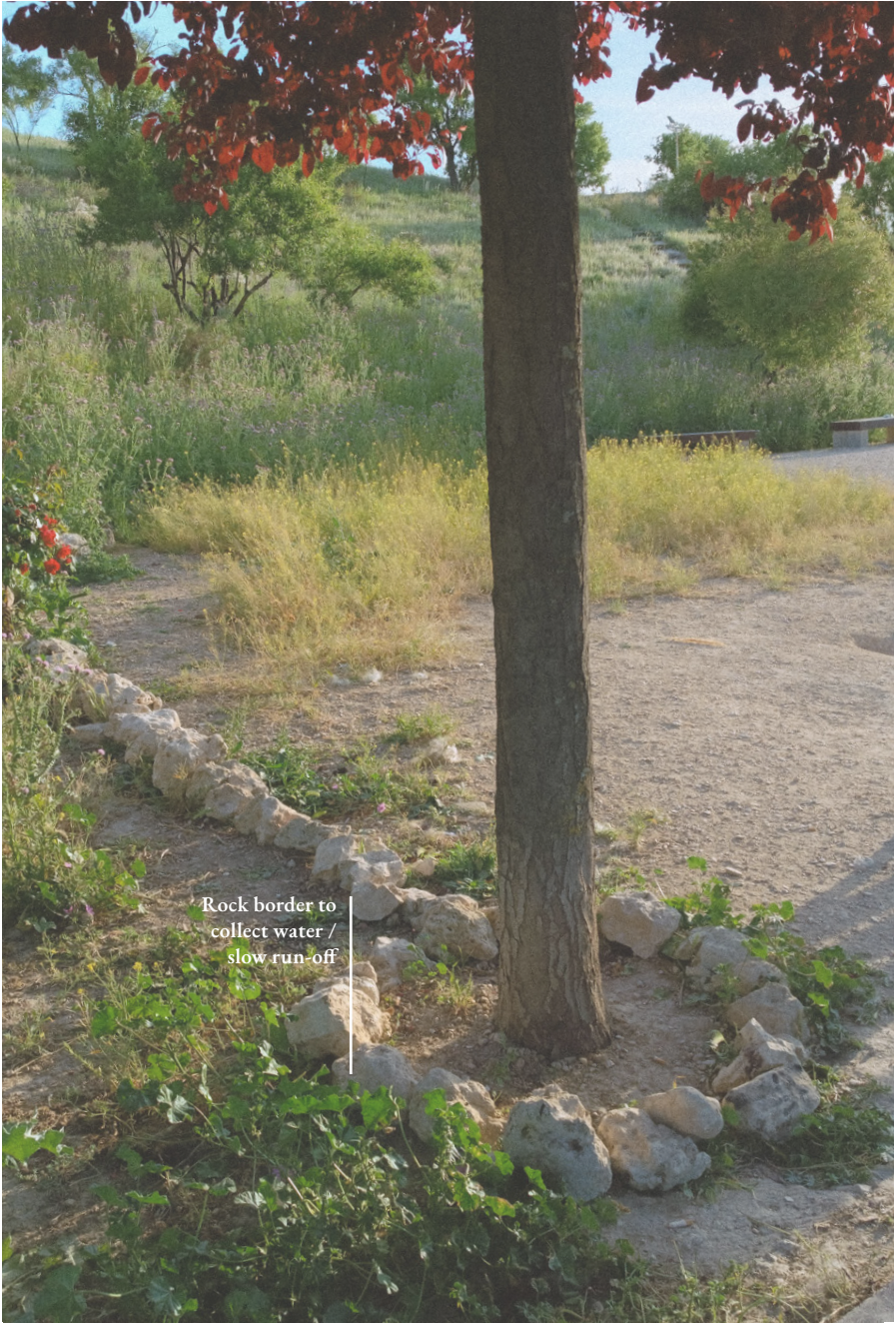


Water from precipitation collected to seep into the soil

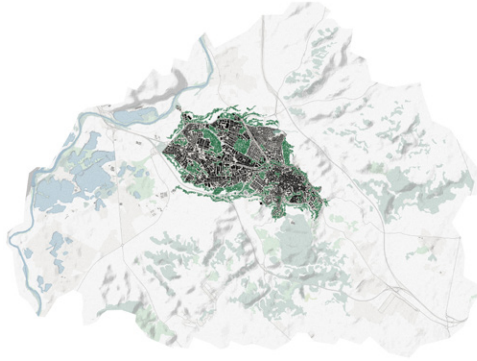


Water runoff slowed down by terraces

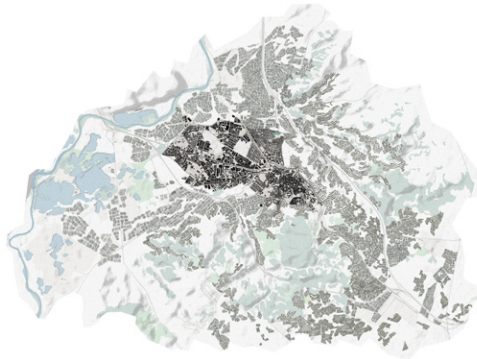




Rock border to collect water / slow run-off



Public Green Spaces



Private-owned Cropland as the Partial Commons and Cultural Landscapes

The Partial Commons:

Public Spaces and Private Cropland

*If we cannot commit to
agroforestry, what other
options are there?*

Partaking in the Partial Commons: Building A Sustainable Cultural Landscape

Understandably, there are many hurdles to making changes and adopting new agricultural practices. You can take part in the commons in other smaller ways. You can also slowly expand your ecological contributions overtime or even join the afforestation efforts of the commons in the future!

1. Designating A Portion of Your Land To Growing Ecological Forests

Ecological forests are not grown for production. They are grown to reinforce the ecosystem of the landscape and expand the forest cover of the general region. The upstream of the Tagus Basin is facing intense droughts partly due to the low forest cover and high monospecific agricultural activities. Introducing ecological forests back to even just small portions of private cropland can help improve the water-landscape.

The Common Agricultural Policy (CAP) of the European Commission recommends at least about 5% of farmland to be designated for non-productive ecological use, such as growing ecological forests.

Ecological forests help regulate the humidity of the air and the water in the soil. There are steps in the previous section to guide you on how to grow forests. However, the species of trees you may use would not necessarily be crop trees but native trees of the semi-arid Spanish landscape.

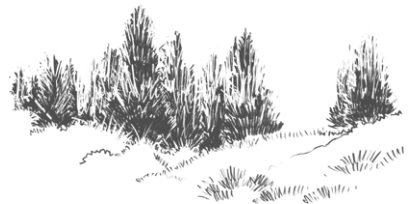
It would be also beneficial to connect these small forests together. Connecting forests helps improve their survivability, creating a stronger environment

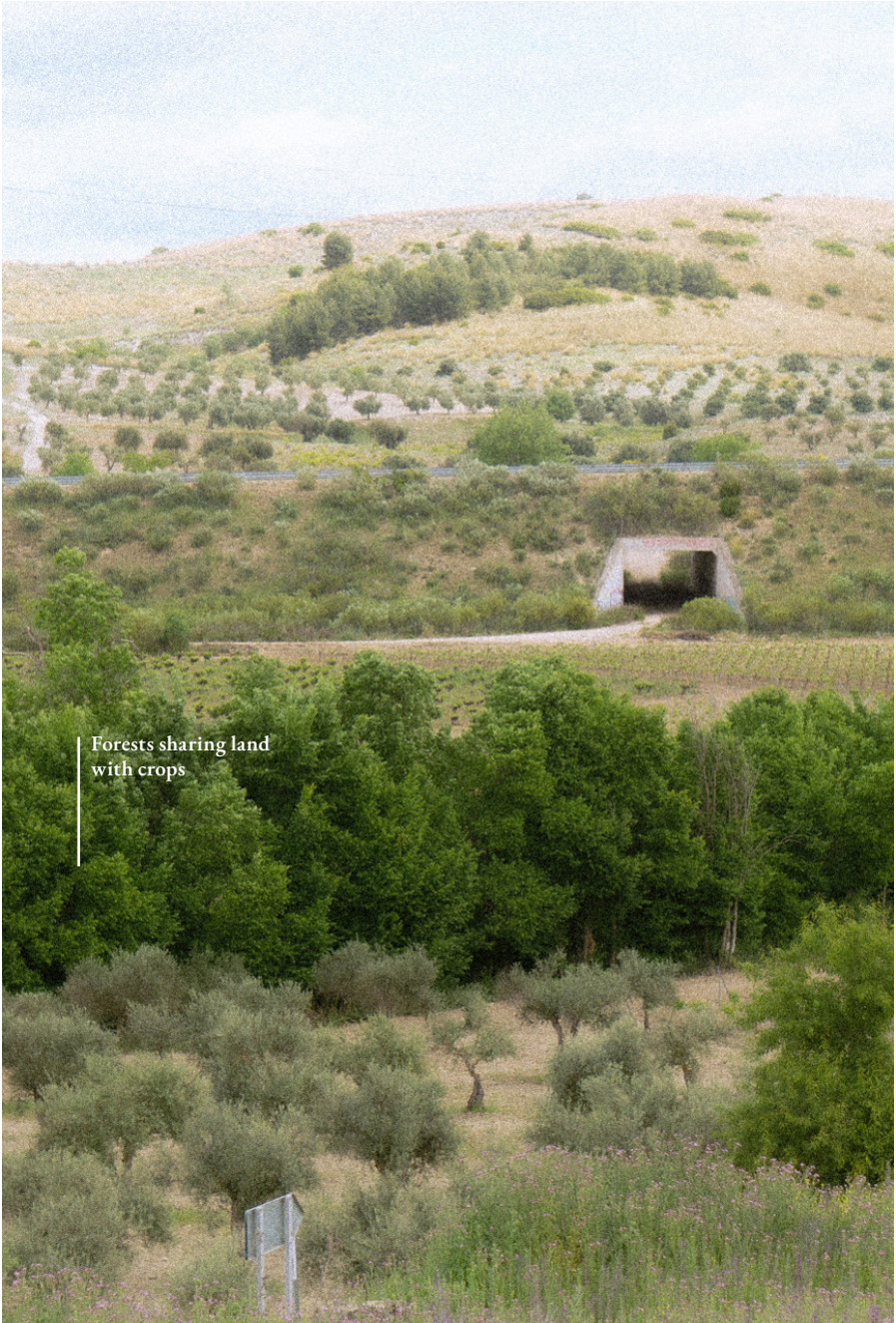
to regulate the water in the ground and humidity of the surroundings.

So talk to your neighbours!

You can refer to the aforementioned guide to growing agroforests. Instead of production trees, you may use native tree species. Remember to...

1. Consider the climate and soil conditions of your plot of land.
2. Prepare your soil for planting. Remove unsuitable vegetation or invasive plants. Mix organic or inorganic fertilisers with the existing soil if necessary.
3. Procure seedlings / saplings of your selected species from your preferred nursery.
4. Establish a water-management system. Ideally, they should be watered regularly during dry seasons using localised or drip irrigation during their seedling phase. Alternatively, growing your forest near an existing forest can help the survivability rate of your plants.
5. Plant your seedlings / saplings on your land and add an additional layer of mulch to protect the soil and roots from excess water losses to evaporation during dry seasons.





Forests sharing land
with crops

2. Incorporate Crop Rotations To Your Farming

Plant different types of crops that are compatible with each other to improve the health of the soil and maintain a sustainable supply of nutrients.

This is especially helpful to retain water in the soil if one of these crops are tree crops that can help shade the soil and the understorey layer of smaller crops from the heat during dry seasons. It can help protect the ground from excess water loss to evaporation during these times.

For instance, if you own a wheat field, you can plant some walnut trees amongst the fields.

3. Adding Non-Productive Layers To Your Cropland

If you own an olive grove or grow other tree crops over bare soil, you could consider planting smaller perennial shrubs that are native to the landscape.

Avoid non-native species, especially those classified in the National Catalogue of Invasive Exotic Species. Invasive species are likely to out-compete your crops or surrounding native species for water and nutrients.

Make sure that these non-productive layers are compatible with your existing crop. Ideally, they should have shallow root systems that do not need more water than your crops do. These layers and their combined root system of these layers can help break up the soil and allow water to infiltrate more easily.

The benefits of growing perennials with fruiting trees are that they establish a regular ecosystem that is not often disrupted and help provide a sustainable cycle of nutrients to the soil while maintaining groundwater levels by improving water infiltration.



Lavandula stoechas
"Spanish Lavender"
Native, Perennial



Antirrhinum graniticum
"Spanish Snapdragon"
Native, Perennial



Stipa tenacissima
"Esparto Grass"
Native, Perennial



Cistus creticus
"Cretan Rockrose"
Native, Perennial



Echium vulgare
"Viper's Bugloss"
Native, Perennial



Asphodelus ramosus
"Branched Asphodel"
Native, Perennial



Malva multiflora
"Cretan mallow"
Native, Annual/Biennial



Hirschfeldia incana
"Mediterranean Mustard"
Native, Perennial

What kind of common shrubs are native and perennial?



Gargüera de la Vera

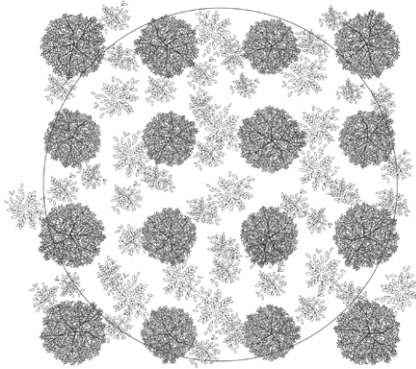
Olive tree grove with potato cultivation as an understory layer.



Landete

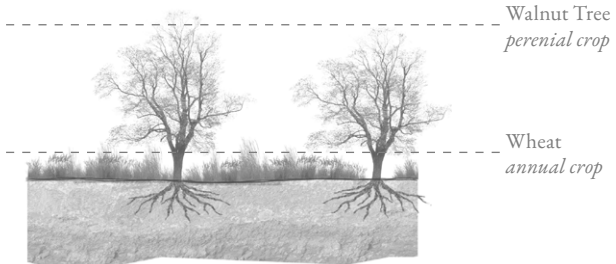
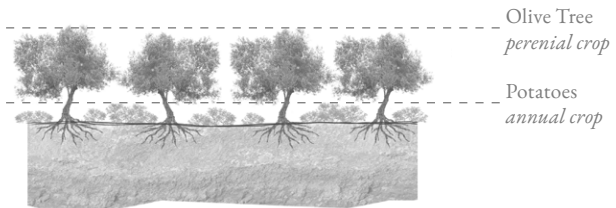
Walnut tree cultivation for wood amongst a wheat understory layer

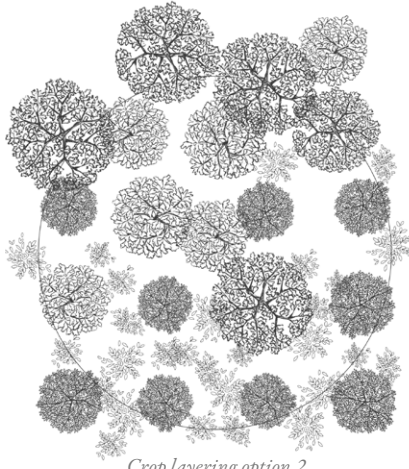
What are some combinations that are already in practice?



Crop layering option 1

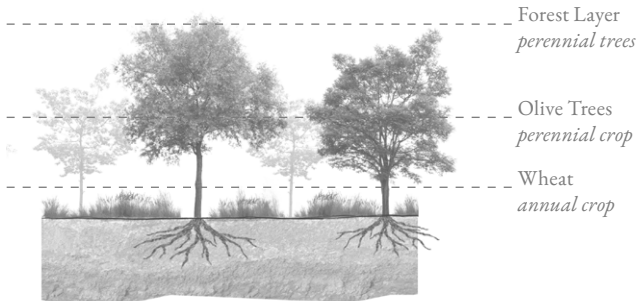
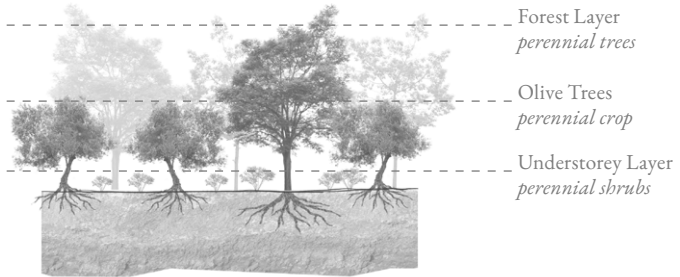
Tree crops mixed with low understorey crops,
preferably with shallow root systems.



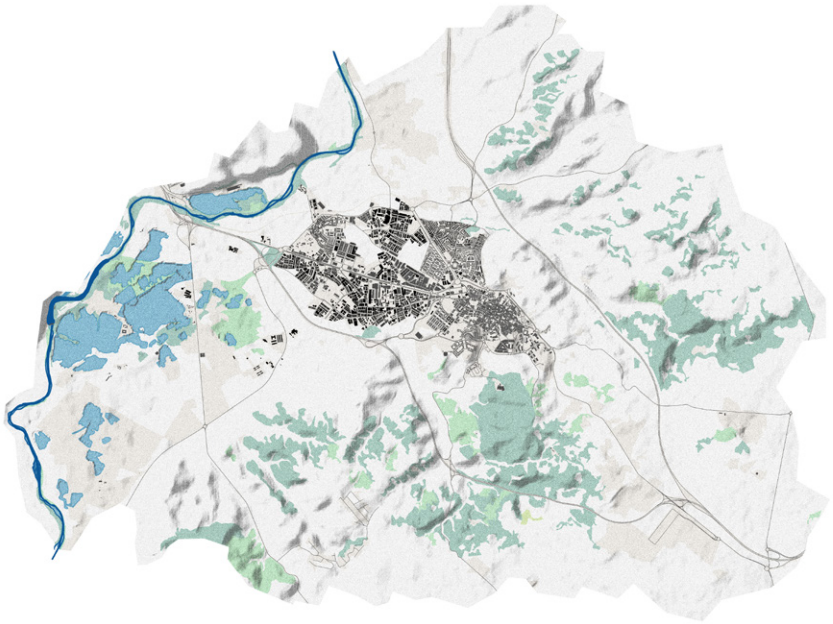


Crop layering option 2

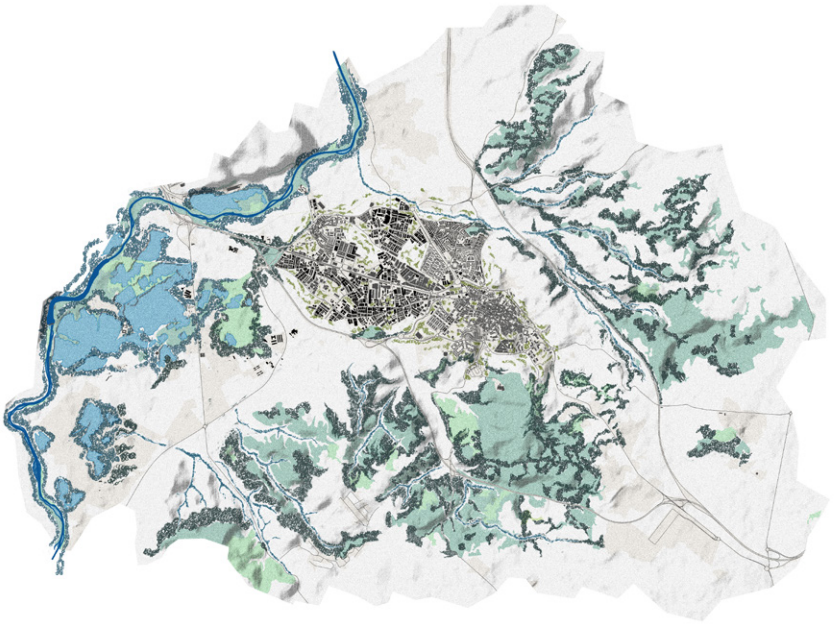
Crops mixed with ecological forests, preferably with shallow root systems.



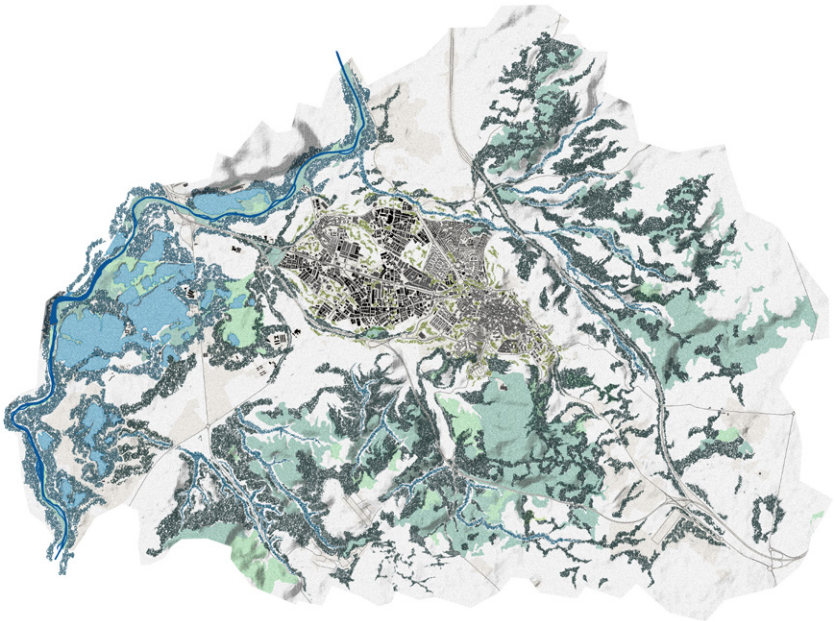
*If we collaborate
and grow a little
every year, we can
help sustain the
water-landscape for
the future...*



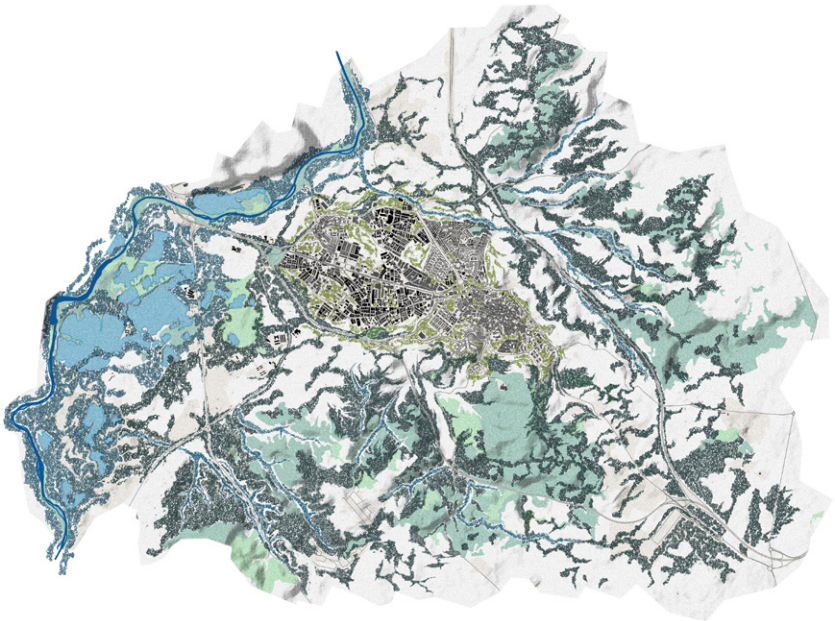
In 6 - 8 years...



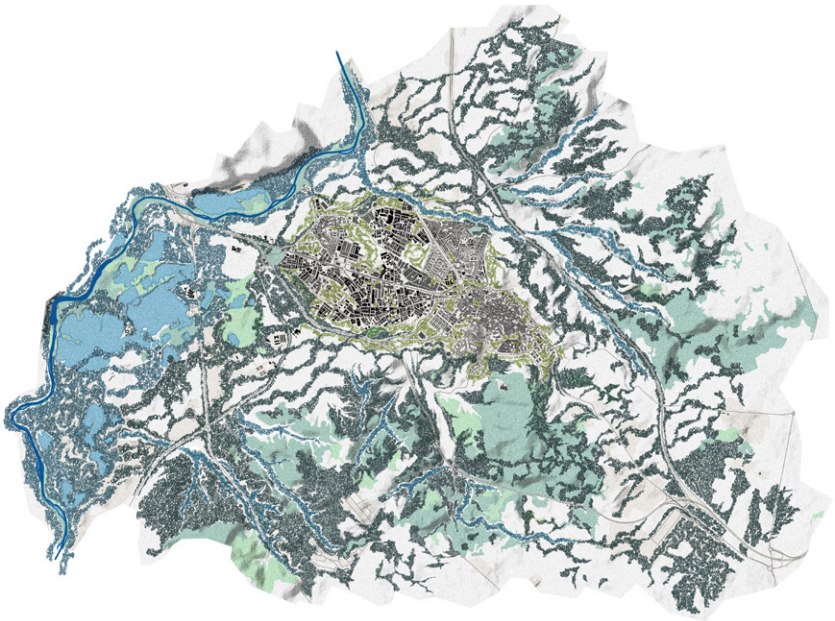
9 - 15 years...



16 - 23 years...



24 - 30 years...



Thank you



