Green Skills

Erasmus +

Co-funded by
the European Union

Content

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The photographs used in the work were taken by participants of the Erasmus + project "Green Skills". Some of the visualizations were also developed using "AI- Image.art".

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Bulduri, 2025

ISBN 978-9934-9252-5-2

Introduction

The impact of climate change, which affects the well-being of humans and other living beings, is becoming increasingly relevant in Europe and the world.

During the implementation of the Erasmus + Cooperation Partnership project KA2 "Increase the skills in green environment" / “Green Skills” 2023-1-LV01-KA220-000159616, sustainable plant growing and garden design methods were explored to find solutions in various horticultural sectors under the influence of climate change. The project involved 6 horticultural schools from different European countries (France, Belgium, the Czech Republic and Latvia), who shared their experiences and learned various green skills that are relevant in future gardening.

This teaching material on "green skills" summarises the experience of each partner school, which was shared with other project participants from other European countries in order to expand both theoretical knowledge and practical skills, understanding of plant biodiversity in different European climatic regions, as well as agroecological methods that can be used in both rural and urban environments.

The book provides knowledge and practical advice on:

- the specifics of creating a Mediterranean climate garden and the possibilities of using green transport, implemented by the ***Etablissement Public Local d'Enseignement et de Formation Professionnelle Agricoles- Louis Giraud*** in France;
- creating an agroecological garden and raised beds, implemented by the ***Lycée Professionnel Olivier Guichard*** school in France;
- using computer software to design small gardens and creation of topiary garden, implemented by the ***EPASC -Ecole Provinciale d'Agronomie et des Sciences de Ciney*** school in Belgium;
- the installation of fruit tree and shrub espaliers, implemented by ***Bulduri Technical*** school in Latvia;
- the installation and maintenance of lawns using various mechanical tools at the ***Střední zahradnická škola Rajhrad*** school in the Czech Republic;
- creating roof gardens and bee-friendly gardens at the ***Ecole D'horticulture Ville de Liege*** school in Belgium.

The book is in English and is richly illustrated with drawings, photographs and plant lists. We hope that the book will be a source of inspiration for both young people and educators to expand their knowledge and draw ideas for implementing green skills in their schools, homes and neighborhoods. So that the environment we live in becomes greener, more diverse and more aesthetic.

The teaching material was created thanks to co-financing from the European Union.

Gunta Jēkabsone
Erasmus + project coordinator

Co-funded by the European Union

Bulduru Tehnikums

Střední zahradnická škola Rajhrad, příspěvková organizace
Tvoříme krásu...

ÉCOLE D'HORTICULTURE VILLE DE LIÈGE

CAMPUS PROVENCE-VENTOUX

Olivier Guichard GUÉRANDE

PROVINCE de NAMUR
École d'Agronomie et Sciences de Ciney

Create a garden in mediterranean climate. A way of using green transport.

The Provence-Alpes-Côte d'Azur (PACA) region is particularly vulnerable to the effects of climate change. With temperatures rising faster than the national average and extreme weather events becoming more frequent, this region is facing major environmental challenges. Droughts, floods and heat waves all impact not only the ecosystem, but also the local economy, including agriculture and tourism.

Faced with these challenges, it is crucial to rethink garden design. Traditional gardens, often based on plant species that are not well adapted to extreme climatic conditions, must evolve. The integration of resilient plants, such as Mediterranean species that require less water and are more tolerant to heat, is becoming essential. In addition, implementing rainwater harvesting systems and using sustainable gardening techniques, such as mulching and composting, can help reduce the impact of drought. Gardens can also play a role in mitigating the effects of urban heat islands. Promoting biodiversity and creating green spaces can improve air quality and provide shelters for local wildlife. Therefore, garden designs should not only be aesthetically pleasing, but also functional and ecological.

At the same time, mobility in the workplace must also adapt to the challenges of climate change. The use of the bicycle as a mode of transport has many advantages, both ecologically and economically. By reducing the carbon footprint of commuting, cycling contributes to the fight against climate change. In addition, it helps to relieve congestion on the roads and reduce air pollution, a crucial issue in the urban areas of the PACA region.

To encourage this practice, local authorities need to invest in appropriate infrastructure, such as safe cycle paths and bicycle parking. Companies can also play a role by setting up incentives for their employees, such as bonuses for bike rides or bike rental programs.

Conclusion

In short, climate change in the PACA region requires adaptation at different levels. Garden designs must evolve to incorporate sustainable and resilient practices, while the use of cycling as a mode of professional transport must be encouraged to reduce environmental impact. By acting proactively, the region can not only adapt to climate challenges, but also contribute to a more sustainable future. In the France region - Vaucluse, climate change is leading to drier conditions and higher temperatures. To create sustainable ornamental gardens while adapting to these new conditions, it is wise to use plant species adapted to drought and heat. Here are some suggestions:

Options

1. Aloe vera: A succulent plant that requires little water and has medicinal properties.
2. Other succulents: These are ideal for dry gardens and require little maintenance.

Additional Tips

- **Mulching:** Using mulch to conserve soil moisture.
- **Initial irrigation:** During plant establishment, regular watering will be necessary, but once established, these plants will need little water.
- **Choice of location:** Choose sunny and well-drained locations for most of these species.

By choosing these suitable plants, you can create an ornamental garden that will not only be aesthetically pleasing, but also resilient to the challenges posed by climate change.

Objectives

- Producing quality grapes in AOC Ventoux
- Limiting the impacts of climate hazards
- Promoting biodiversity
- Improving soils
- Provide educational support
- Energizing the landscape

Planting trees in the middle of the vineyards

"Field and fruit shrubs, sacrificed on the altar of mechanization and productivity, are making a comeback in and around the vineyards. In the name of biodiversity, climate resilience and soil life." Excerpt from the Revue du Vin de France, August 2021, Julie Reux
The hedgerow has multiple advantages, both for agricultural production and in terms of biodiversity.

From an agronomic point of view, hedgerows act as **windbreaks,** protecting crops, as the wind causes **evapotranspiration** of plants and drying out of the soil.
Hedges have a real benefit in terms of shade, limiting scalding.
Trees limit **soil erosion** and recreate organic matter by producing leaves and branches that will decompose and activate a whole biological life.
The hedge plays the major role of **ecological corridors**, it allows species to move. It is home to our crops' auxiliaries (pollinators, pest predators).
The presence of trees promotes good in a territory. A natural drain thanks to its roots, the hedge allows surface water to replenish the water table. The root system of trees also allows for water filtration and purification by absorbing excess nutrients, minerals and other pollutants from runoff.
In addition, the presence of trees regulates the water cycle. True sponges in wet periods, they release this water through evapotranspiration and their roots in times of drought.

Soil testing
Surface: rich in coarse elements (gravel > pebbles; mostly limestone, some flints).
The conglomerates seen in 2015 were broken to the ground, after the vines were uprooted.
Soil profiles:
From 0 to 50/60 cm: fine structure due to tillage.
To the southeast: reddish-yellow soil; numerous coarse elements along the entire profile (0 – 60 cm); sandier than on the other sites.
To the north: brown soil; in the profile: the presence of coarse elements increases from the surface to the depth; From absent to few in the first horizon (0 – 30 cm), they increase to many around 50 cm (depending on the observation sites).
Soil profiles 2022 (before the vines were uprooted and the soil was ploughed): in the majority of observation sites at 40 cm: limestone "concrete" crust that closes the soil and makes it unsuitable for root penetration.
In 2015, a profile also revealed a limestone slab (crust) at a depth of 90 cm.
Physicochemical characteristics:
Road side (South): limestone clayey silt sand / Water pH 8.4 / Total limestone 180 g/kg / MO 2.5 %1 Ditto on the Mede side (North)

Mediterranean plants

Lavandula (Lavender): Very resistant to drought, it attracts pollinators and offers a beautiful flowering.

Rosmarinus officinalis (Rosemary): An aromatic shrub that thrives in full sun and requires little water.

Thymus (Thyme): Perfect for dry gardens, it is both decorative and useful in the kitchen.

Cistus (Cistus): A flowering shrub that tolerates heat and poor soils well.

Santolina chamaecyparissus (Grey santolin): persistant and rustic, aromatic bundles of tiny, coral-like stemsof silver filigree huddle close to the ground, producing yellow buttons in summer.

Lippia nodiflora (Creeping vervain): small-leaved, ground hugging runners with abundant heads of small pink and white flowers, good for the bees.

Ballota pseudodictamnus (Ballota): One of the loveliest greys. From a woody base spring long curving stems of round leaves clothed in grey-white felt.

Teucrium hircanicum (Iranian germander): A showy perennial boasting dozens of upright lavender flower spikes in mid to late summer, over a lush mound of fragrant, sage-like, green leaves.

Perovskia atriplicifolia"Lacey blue"(Afghan sage): It's known for its aromatic, gray-green leaves and vibrant violet-blue flowers that bloom from June to September.

Helichrysum italicum (Curry plant): species of flowering plant in the family Asteraceae. It is sometimes called the curry plant because of the strong fragrance of its leaves.

Cordyline australis (Cordyline): It grows up to 3 metres tall with a stout trunk and sword-like leaves, which are clustered at the tips of the branches and can be up to 1 metre long.

Cistus sp.(Cistus): a genus of evergreen shrubs known for their drought tolerance and attractive, papery flowers.

Agapanthus (Agapanthus): Agapanthus are known for their large, blue drumstick-headed flowers in summer. Knowned like lily of the Nile.

Salvia microphylla (Ornememtal sage): It's a member of the mint family (Lamiaceae) and is known for its vibrant flowers and aromatic foliage. It's a popular choice for gardens due to its drought and heat tolerance.

Yucca filamentosa (String yucca): Yucca plants, especially their leaves, contain long, strong fibers that can be separated and twisted into a usable material for various purposes.

Sambucus nigra (Black elder): A bushy large shrub or small tree to 6m, with pinnate leaves turning pale yellow in autumn, flat sprays of fragrant cream flowers in early summer.

Echinacea (Echinacea): Drought-resistant, it attracts butterflies and comes in several colors Low-maintenance succulents that bloom in the summer.

Olea europaea (Olive tree): An emblematic tree of the region, it is very resistant to drought.

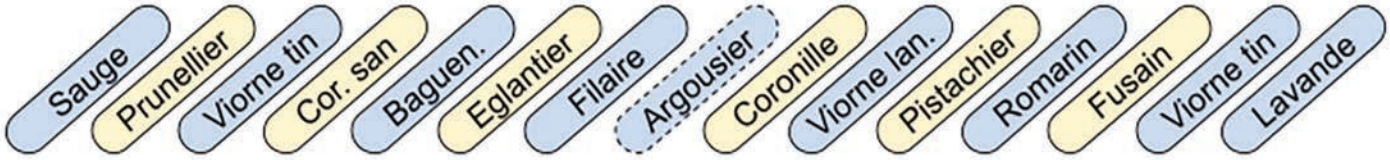
Bougainvillea (Bougainvillea): A colourful climbing plant that blooms abundantly in full sun.

Gaura lindheimeri (Gaura): A perennial that blooms for a long time and is drought resistant.

Quercus ilex (Holm oak): A Mediterranean tree adapted to dry conditions.

Hedera helix (Creeping ivy): an invasive herbaceous perennial plant that forms evergreen mats that spread 1-3 feet.

Proposed planting module



Alternating deciduous and evergreen foliage, distribution according to their adult development.

15 Species	Folliage	Height
Lavande officinale / Fine lavender */Lavandula angustifolia*	persistent	60 cm
Sauge officinale / Common Sage *Salvia officinalis*	persistent	70 cm
Coronille / Coronilla *Coronilla glauca*	deciduous	1 to 1.5 m
Viorne lantane / Wayfaring tree *Viburnum lantana*	deciduous	1.5 m
Romarin / Rosemary *Rosmarinus*	persistent	1 to 2 m
Filaire à feuille étroite / Narrow-leaved filaria *Phillyrea angustifolia*	persistent	1 to 2 m
Cornouiller sanguin / Blood Dogwood *Cornus sanguinea*	deciduous	1 to 2 m
Prunellier /Blackthorn *Prunus spinosa*	deciduous	1 to 4 m
Fusain d'Europe /European spindle tree *Euonymus europaeus*	deciduous	1 to 4 m
Viorne tin / Laurustinus *Viburnum tinus*	persistent	2 to 4 m
Baguenaudier / Bladder senna *Colutea arborescens*	deciduous	2 to 4 m
Eglantier /Rosehip *Rosa canina*	deciduous	2 to 4 m
Pistachier térébinthe / Terebinth pistachio tree *Pistacia terebinthus*	deciduous	3 to 5 m
Argousier / Sea buckthorn *Hippophae rhamnoides*	persistent	5 m

Creation of mediterranean garden.
Installation of protections for the passage of the inter-vine blade (mechanical weeding).
Implementation of irrigation, in the same way as the one of the vines (the first 3 years only to maximize the establishment).
Hedge maintenance: with trimmer.

Choice of the species
Endemic, local plants, perfectly acclimatised and adapted to the territory.
Provided by: sampling and production processes designed to **preserve the natural qualities of the plants** and to **pre-acclimatize** the plants to the stationary conditions of the future sites.
The composition of the plant ranges is representative of the natural indigenous processions.
The natural adaptability of local plants offers a better durability of the works carried out and an optimal recovery rate. It improves the quality of the ecosystem therefore “recreated”, in terms of biodiversity and impact on the environment (genetics, pathologies, etc.)
Species adapted to dry and shallow soil, non-invasive and non-host insect of *Drosophilia suzukii*.

To test ground cover and avoid mechanical work, plantation of oregano (100 pcs.), savory (100 pcs.) and thyme (40 pcs.) alternately on about 90 m. Planting density : 4 plants between 2 shrubs.

Notes: Anticipate headlands of 9 m. Northern limit = outside the runway, southern limit = at the height of the electricity poles. Distance between trees: 1.5 m. Distance from the vine: 5 m.
West Hedge: approx. 159 m. 107 trees divided into 7 modules of 21 m composed of 15 species.

Using mapping soware to organize cycling outings.

Plan the route independently without using other service providers.
• Getting started with a mapping solution: OCAD (free version), Purple Pen and Openstreetmap.
• Route planning.

Choose a route suitable for group trips, select interesting objects for sightseeing on the route. Distance calculation, determination of the level of difficulty of the map/terraain relations and printing the route.
Overall objective: To raise participants awareness of power cycling as a sustainable means of transport and to promote soft mobility practices.
Introduction to power cycling.
Power cycling helps develop the leg muscles, especially the quadriceps and hamstrings. It also helps improve the strength of the leg muscles, which are necessary for good control of the bike.
If you practice power training regularly, it helps to strengthen the muscles and increase their ability to overcome various loads, such as hill climbs or steep transitions.

Cycling is one of the most environmentally friendly and economical modes of transport, which also offers many health benefits. It is a great alternative that provides benefits not only for individual health, but also for society and the environment as a whole.
Reduces carbon dioxide (CO_2) emissions:
By reducing the use of cars, it reduce air pollution.
Bicycles are a quiet means of transport that reduces noise in cities and contributes to a more peaceful living environment.
Bicycles consume fewer resources than cars and require less maintenance.
Bicycles have a more sustainable life cycle and generate less waste than the production and use of cars.

Before the ride
Repeat safety rules and safety equipment (helmets, gloves, vests).
Introductory course: learning how to adjust the bike and riding position.
Observing participants during the ride to prevent participants from having difficulties
For group bike rides, plan a route of approximately 10–15 km.

Using an Electric-Assisted Bicycle (EAB)

Electric bicycles (also known as electric bicycles, EAB) are bicycles equipped with an electric motor that assists the pedaling. These bicycles combine the features of a traditional bicycle with an electric motor that provides additional power, making riding more comfortable, faster, and less tiring, especially on hilly terrain or long journeys which is typical of the southern region of France.

How do electric bicycles work?
Electric bicycles consist of the following main components:
Motor – Usually located in the hub (center of the wheel) or on the drivetrain (for example, on a chain or gear system). The motor assists the rider in pedaling with additional power.
Battery – Provides electrical energy to the motor. It can usually be charged at home and provides varying ranges depending on the battery capacity.

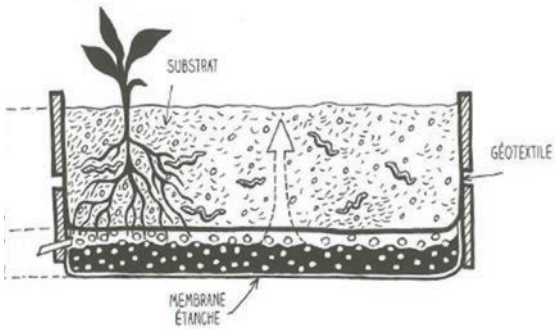
Controller – This regulates the motor's operation according to the rider's pedaling movements and speed. The controller may be built into the handlebars or elsewhere, and usually allows you to select different levels of assistance (pedal power assistance itself, manual control, etc.).

Electric bicycles offer many advantages, both ecological and economic, promoting improved physical health while reducing physical effort. Being environmentally friendly, cost-effective and easy to use, electric bicycles have become a popular and sustainable transport solution that can be used in professional environments, for trips and work.

Mountain Bike

Electric Bike

Establishment of an ecological garden and creation of raised beds.



Schematic diagrams of self-watering raised beds

The tank is sealed with a membrane.
The lower section features a bed of clay balls covered by a geotextile layer. Thanks to their capillarity, the clay balls allow water to rise towards the root system.
An overflow put in place just under the geotextile to avoid an excessive water level which could drown the roots.

The courtyard of the O. Guichard High School is a fully mineralized space. Improvements have been made to create a more welcoming space for students, with green spaces to reduce heat islands and promote biodiversity. The first phase of these developments was carried out with our European partners. The aim was to create, in partnership with the first-year landscaping class, water-storage planters and place them in the high school courtyard. The plant selection criteria were as follows: drought resistance, aesthetic association, and plants that promote biodiversity.

The stages of the raised beds realization

1. 
2. 
3. 
4. 
5. 
6. 

Creation of raised beds
Description furture below.

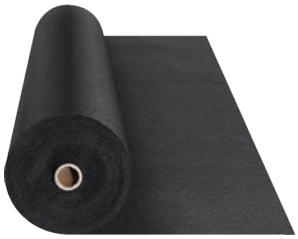
Filling the raised beds
The raised beds fill with a substrate including horticultural soil, compost - from the high school's organic waste composting and dehydrated manure.

Setting up the raised beds
The base of the raised beds was designed so that they could be easily loaded by pallet trucks.
The raised beds could be transported and placed in the territory. Then water them thoroughly, until the overflow are overflowing.

Planting plants
Arrange the plants with the aim of complemeting each other. Then plant using the following technique: Soak the cups in water for a few minutes. Dig a hole slightly larger than the root ball. Place the plant in it, then fill it in again, lightly tamping the soil around it. Water thoroughly.

Working materials

LV - Koka sloksne
FR/BE - Tasseau
ENG - Wooden strip
CZ - Dřevěná lišta



LV - Ģeotekstils + PVC membrāna
FR/BE - Geotextile + membrane PVC
ENG - Geotextile + PVC membrane
CZ - Geotextilie + PVC membrána

LV - Dēļi
FR/BE - Planches
ENG - Boards
CZ - Desky

LV - Keramzīts
FR/BE - Billes d argile
ENG - Clay balls
CZ - Bola ti damili

LV - Skrūve
FR/BE - Vis
ENG - Screw
CZ - Šroub

LV - Augsne
FR/BE - Terreau potting
ENG - Soil
CZ - Zemina do květináčů

LV - Linsēklu eļļa
FR/BE - Huile de lin
ENG - Flaxseed oil
CZ - Lněný olej

LV - Organisks mēslojums
FR/BE - Amemdement organique
ENG - Organic manure
CZ - Organický dodatek

Plants suitable for raised beds

Allium schoenoprasum

Aster alpinus

Aubrieta

Bergenia cordifolia

Calendula officinalis

Calluna vulgaris

Crocus vernus

Erigeron karvinskianus

Geranium sanguineum

Hedera helix

Lavandula angustifolia

Petasites pyrenaicus

Salvia officinalis

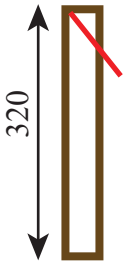
Sedum album

Necessary parts for raised beds

Side board
27 x 200 x 1200 = 4 pcs.
Large Side

Side board
27 x 200 x 660 = 4 pcs.
Small Side

Support bars
(Assembling the bottom)
43x45x580 = 3 pcs.



Support bars (Assembling the sides)
46 x 46 x 320 = 6 pcs.
45° cut at the top.

Bottom board
27 x 200 x 1200 = 3 pcs.
Bottom

Necessary parts for cutting

Cutting side plans – 3 boards of 27 x 200 x 4000

x2

Cut in pices of 1200 x 2 pcs. + 660 x 2 pcs.

x1

Cut in pices of 1200 x 3 pcs.

Cutting surface of support bars – 3 boards of 46 x 46 x 3000

x1

Cut in pices of 580 x 3 pcs. + 320 x 3 pcs.

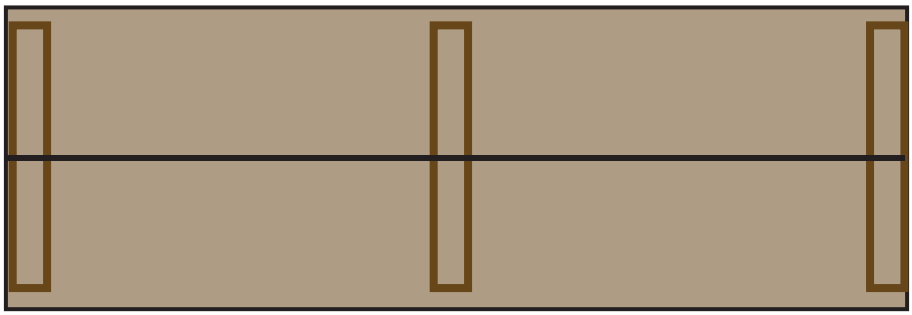
x1

Cut in pices of 320 x 3 pcs.

All dimensions are expressed in mm

Making the wooden raised beds

1) Tracing the different parts.
2) Cutting.

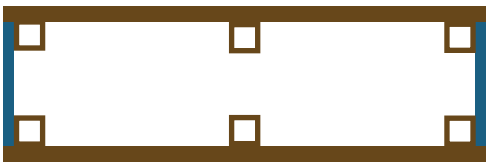


3) Assemble the 2 large sides by screwing the support bars.

x2

Leave 2.7 cm thick to allow the bottom to recess.

x2



4) Assemble the small sides by screwing them on to support bars, as shown above.

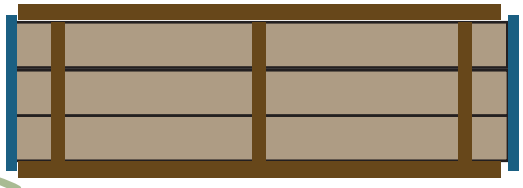
x1

5) Assemble the bottom.

Support bar fixed 50 mm from the edge.

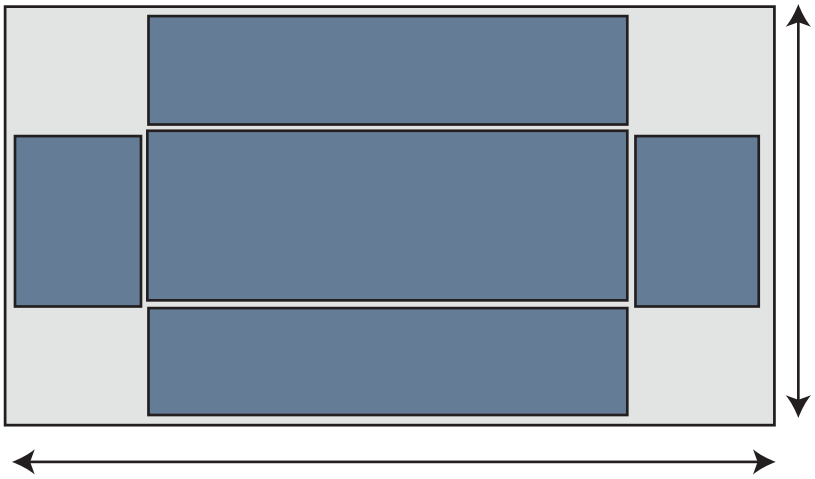
6) Recess the bottom and screw it in at the 4 corners and in the middle.

7) Fix the middle cleat by screwing it in from the inside.

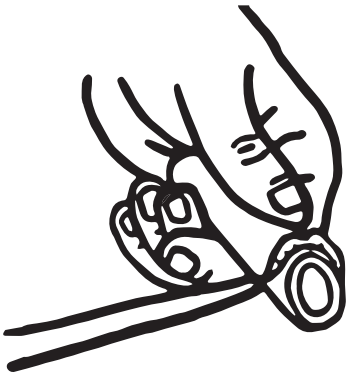


Realization of the waterproofing

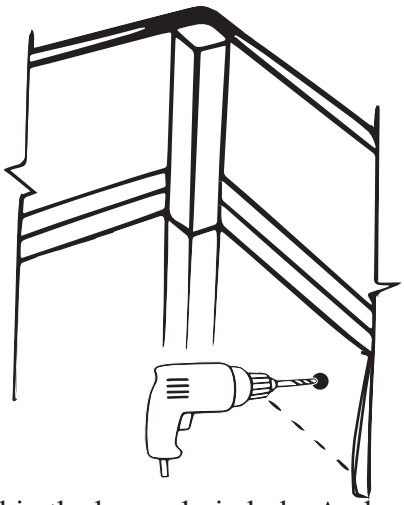
Cut the tarpaulin: lenght = 200 wide= 140; Place it in the empty high box, being careful to adjust the angles at the bottom (otherwise the weight of the materials will create tension on the tarpaulin). Staple at the top. Be careful not to puncture the tarpaulin at the bottom.



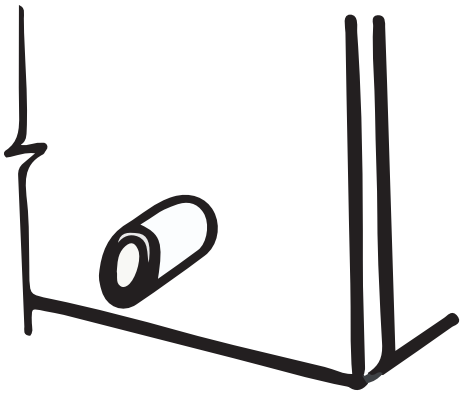
Preparation of drainage



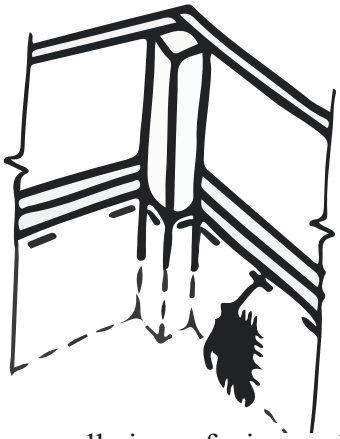
1. Lay a polyurethane cord around the globe with the help of glue.



2. Drill in the box a drain hole. And cut the tarpaulin opposite the drain hole.

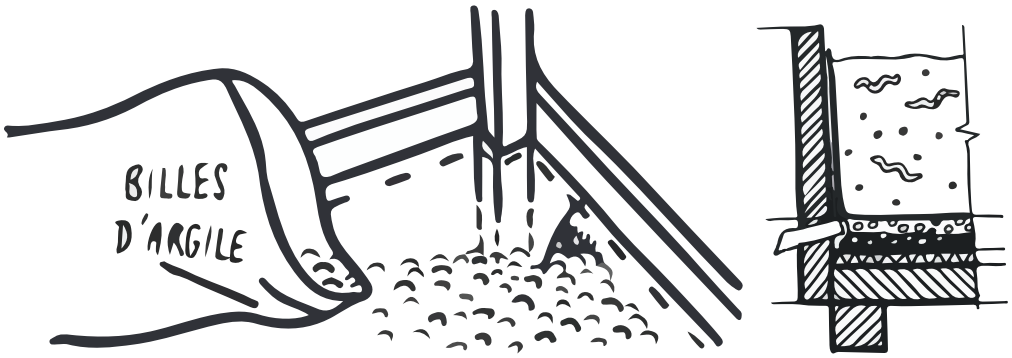


3. Push in the tube and smooth the polyurethane seal with the fingers let it dry.



4. Staple a small piece of wire mesh to prevent clay pebbles frvom entering the tube.

3. Filling clay pebbles to a height of 7 cm, volume = 50 l



Setting up the geotextile.

Cut the geotextile: lenght = 180 wide= 120;
Place it in the high box on top of clay pebbles, being careful to adjust the angles at the bottom (otherwise the weight of the materials will create tension on the tarp).
Staple at the top.

After assembling the high box, can start filling a mixture of compost and garden soil and continue with planting the selected plants.

Directed work arrangement of plants

When creating a bed, the following rules must be observed:

- Choose plants adapted to soil and climate conditions;
- Choose plants adapted to the available space and the desired use.

In order to create an aesthetic bed, it is necessary to respect certain rules:

- Choose plants in accordance with the desired style of bed (e.g. Mediterranean atmosphere, blue garden, heather garden, etc.);
- Put the largest plants in the background and the smallest ones in the foreground;
- Create contrasts in shape, colour or texture so that the shrubs enhance each other;
- Create harmonies by bringing together shrubs that have common points in shapes, colours or textures.

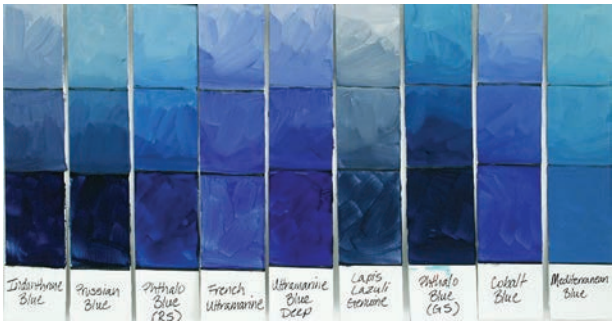
The Colour Wheel

Harmonies
Reinforce the unity of the composition. This gives off an impression of calm, well-being, comfort. An excess of harmony can lead to monotony.

The contrasts
Too much unity risks causing boredom. A succession of similar elements do not stand out.
By creating contrast, the characteristics and identity of each element are brought out and mutually emphasized.

There are 2 ways to create color harmonies:

1) Choose a colour, for example blue, and use it in all its shades, from very light blue almost white to very dark blue tending towards black.



2) Choose 2 primary colours, for example red and yellow, and use all the shades that allow you to go from red to yellow, i.e. all shades more or less orange.

Software garden design and installation of topiary

Introduction and exploration of the software "Vectorworks."

Usage of Vectorworks for garden design step by step
Vectorworks is a powerful design and modeling software particularly useful for gardening and landscaping projects. Here are the key steps to leverage this program for creating or modifying a garden:

1. Project Preparation

Site Analysis: Before starting, gather all necessary information about the garden, such as its dimensions, orientation, soil type, and existing features (trees, buildings, paths).

Project Setup: Launch Vectorworks and create a new file. Set the scale and measurement units appropriate for your project.

2. Garden Plan Creation

Importing or Drawing Borders: If you have a paper or digital plan, you can import it as a base. Alternatively, use drawing tools to outline the garden's borders.

Adding Main Areas: Use polygon or line tools to delineate zones like lawns, flower beds, pathways, or seating areas.

3. Adding Landscape Elements

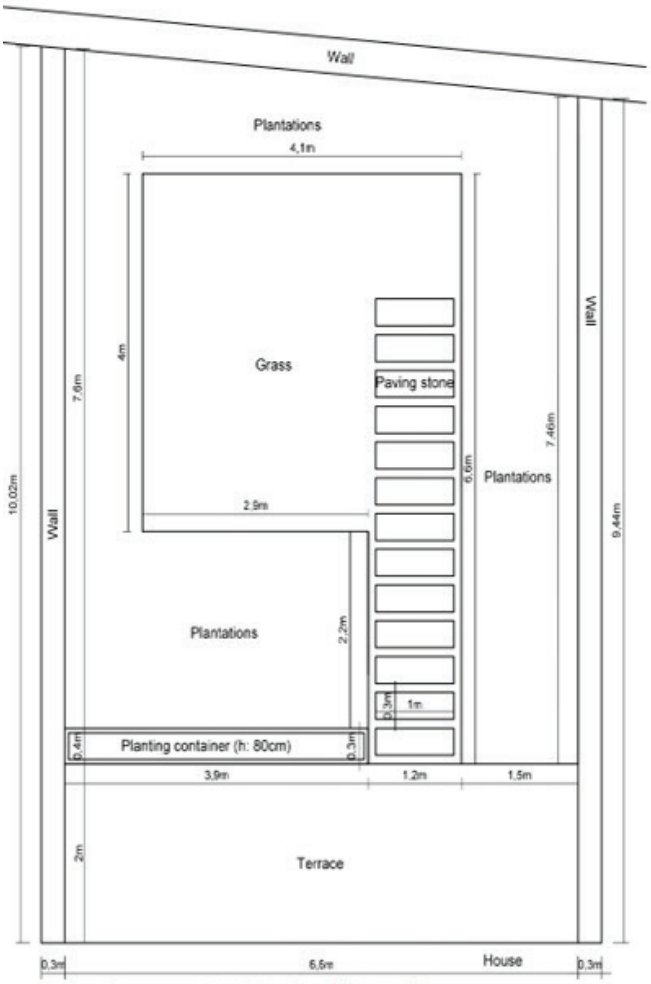
Object Library: Vectorworks provides a library of predefined objects such as trees, shrubs, fountains, and benches. These elements can be easily inserted and placed on the plan.

Custom Element Creation: If needed, draw your own shapes to represent specific garden features.

4. Documentation and Finalization

Annotations: Add annotations, labels, and dimensions to make the plan clear and accessible to collaborators.

Export: Save your project as a PDF or image file to share or print.



Design small garden using computer Vector software

List of plants that can be used to structure gardens

Buxus sempervirens
Perfect for low hedges and topiary, boxwood is appreciated for its dense foliage, slow growth, and evergreen nature.

Fagus sylvatica
Beech trees are commonly used as hedge plants; they tolerate pruning very well and retain their leaves even when dry. Their foliage can be green or purple.

Ligustrum vulgare
Used for hedges and topiaries, privet is valued for its ability to be pruned frequently an

Taxus baccata
Perfect for topiary due to its dense foliage and ease of pruning, the yew can take on many artistic forms.

Lonicera nitida
A small shrub that can reach up to 2 meters, its foliage resembles that of boxwood. It has good vigor and rapid growth and tolerates pruning perfectly.

Ilex crenata
Japanese holly is a small shrub, very hardy and slow-growing, with small, shiny leaves.

Carpinus betulus
Well-suited to temperate climates, it withstands pruning and is used to create arbors; it is semi evergreen and grows quickly, adding verticality when shaped into a columnar form.

Ilex aquifolium
Its evergreen foliage and red berries make it an ideal plant for decorative topiaries, especially during winter.

Hedera helix
Ivy is a climbing plant with vigorous growth; it can quickly cover a structure.

Leveling exercise (topographic survey)

Leveling equipment (materialteaching)

Eng- Optical viewer
Fr- Niveau automatique
LV- Optiskais skatu meklētājs
CZ- Optický hledáček

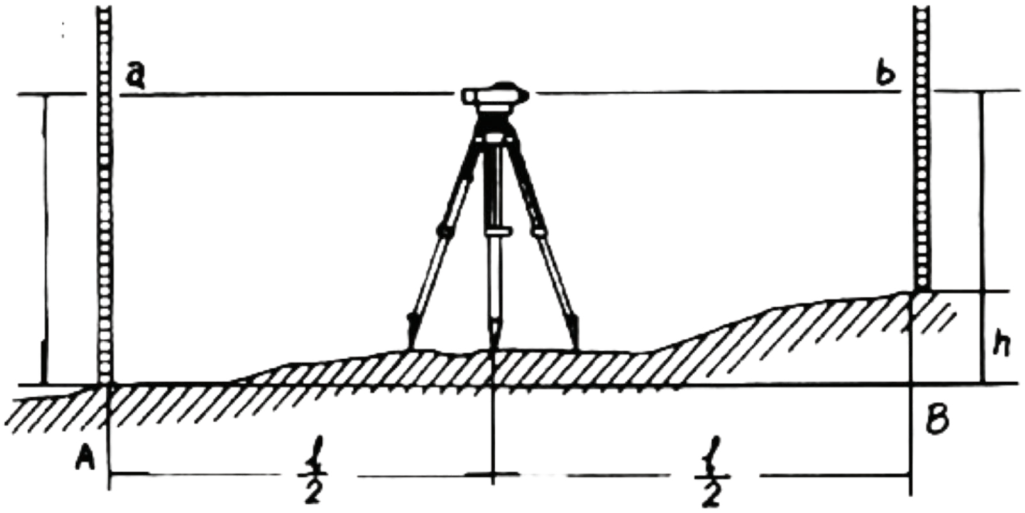
ENG- Leveling Equipment
LV- Līmeņošanas aprīkojums
FR- Équipement de nivellement
CZ- Vyrovnávací zařízení

ENG- Tripod
FR- Pried tripode
LV- Trīskāju statīvs
CZ- Stativ

How to fill in the survey

POINTS NUMBER	READING		difference		FINAL Altidue
	BACK	FORWARD	LESS	PLUSS	
NGF	1.000				80.000
A	1.500	2.000			79.000
B		1.000		0.500	79.500

Methodology
1) Starting point: back reading on the NGF → 1.000
2) Next, read ahead to point A → 2.000
3) Change station
4) Back reading on the point A → 1,500
5) Next, read ahead to point B → 1,000
6) Calculating differences



2.Surveying method

2.1. Measuring altitude difference

Set up the instrument at a point approximately halfway between points A and B.

Set up the staff vertically at point A, and take the reading a (backsight).

Set up the staff vertically at point B, and take the reading b (foresight).

The altitude difference h from B to A is h = a - b.

If the distance between A and B is too long, or the altitude difference from B to A is too large, divide the distance into some regions, then carry on measuring.

POINTS NUMBER	READING		DIFFERENCE		FINAL ALTITUDE
	BACK	FORWARD	LESS	Pluss	
Δ	1,24		0,02		10,00
Δ1		1,26	0,02		9,98
Δ2		1,28	0,41		9,96
Δ3		1,69		0,19	9,55
Δ4	2,83	1,50		0,96	9,74
Δ5		1,87		0,87	10,68
Δ6		1,00		0,20	11,55
Δ7	1,87	0,80	1,76		11,75
Δ8		3,63			9,99

Construction of topiary metal frame of a metal structure

Operating mode

1. Mesure the ground (see description above).
2. Dig holes to a depth of 80 cm.

3. Weld the metal parts needed for anchoring in the ground.

4. Position the letter so as to respect the horizontality

5. Place in the hole of the concrete turbo. Ensuring that it is horizontal.
6. Climbing plants are planted around the frame.

Tools and materials used in the work process

ENG - Clamp
FR - Serre joint
CZ - Svorka
LV - Skava

LV-Līmeņrādis
ENG-Level
CZ-Vodováha libela
FR-Niveau

ENG - Grinder
FR - Disqueuse
CZ - Mlynek
LV - Slīpmašīna

ENG-Sand shovel
FR-Pelle a sable
CZ-
LV-Smilšu lāpsta

ENG - Welding station
FR - Poste a souder
CZ - Svareci stanice
LV - Metināšanas stacija

ENG - Earthmover`s spade
FR - Beche de terrassier
CZ - Ryc pro zemni prace
LV - Zemes lāpsta

LV - Cements
ENG - Cement
CZ - Cement
FR - Ciment

Creation of fruit tree espalier.

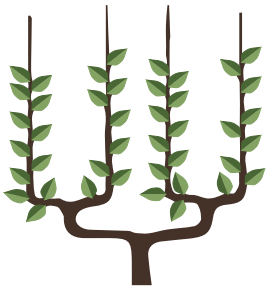
Tree artificial crown maintenance – espalier
Many fruit trees and berry bushes can have different crown shapes. The area of the garden, the formation and pruning and harvesting should be considered when forming the crown. The rootstock is important for fruit trees.
With the right methods, fruit trees and berry bushes can be shaped as desired. The main rule is to form the new shoots into the desired shape while they are flexible. then the branches later retain this shape and continue to be trimmed regularly.

What is an espalier tree
Espalier is a creation of a "two-dimensional" or single-plane pattern made by the tree branches. The word 'espalier' initially referred to the actual trellis on which the plant was trained to grow, but over time has come to be used to describe the technique.
At its most basic - an espalier is a small tree or bush trained to grow flat on the side of a building, along a fence, or as a fence or wall. Technically, espalier is a method of training the tree to grow in a flat form.

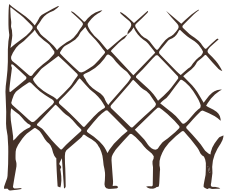
LV- Špaleras	FR - Espalier	UK - Espalier
CZ - Špalir	DE- das Spalier	IT - Spalliera

Types of espaliers:

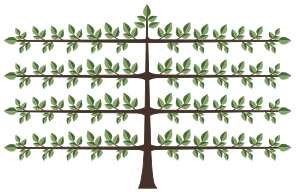
Oblique cordon



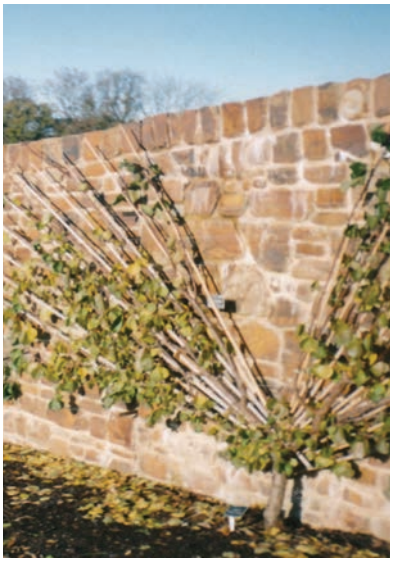
Double U-shaped cordon

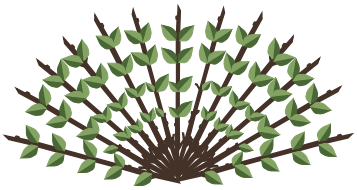


V-shaped cordon or Belgian fence

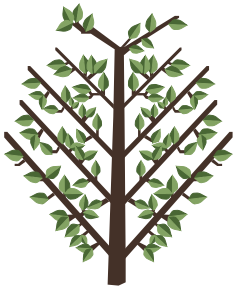


Horizontal palmette



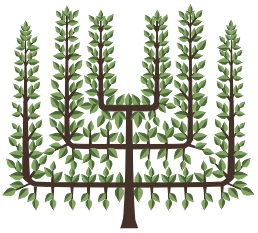


Fan-trained palmette



Oblique palmette

T-shaped palmette



Verge palmette or Vergette palmette

The purpose.
At the very beginning, these trees need careful shaping, but later the shape is maintained by regularly pruning in the summer to limit vegetative growth. Pruning should be done minimally in spring. These shapes require support wires attached to posts, to a wall, or to a fence. An espalier collects almost as much sunlight as a regular tree, yet it has far less mass. It can also be planted next to a wall, reflecting more sunlight and retaining heat overnight, or planted so it faces South and can absorb maximum sunlight. It is a perfect solution for small city gardens. Today, espaliered trees, ornamental and fruit producing, are grown not only against walls, but free-standing on wires, both to save space and to create screens as well. Today, espalier has evolved from a space-saving technique into an art form.

Suitable tree and shrub species for shaping

Aronia melanocarpa
LV-Aronijas
ENG-Aronia berries
FR-Baies d'aronia
CZ-Aronie

Ficus carica
LV-Vīģes
ENG-Figs
FR-Figuier
CZ-Fíkovník obecný

Ficus carica
LV - Vīģes
ENG - Figs
FR - Figuier
CZ - Fíkovník obecný

Malus domestica
LV - Mājas ābele
ENG - Home apple tree
FR - Pommier domestique
CZ - Domácí jabloň

Prunus armeniaca
LV - Aprikozes
ENG - Apricots
FR - Abricotier
CZ - Meruňka

Prunus avium
LV - Saldie ķirši
ENG - Sweet cherries
FR - Meurisier
CZ - Třešeň ptačí

Prunus persica sp
LV - Persiki
ENG - Peaches
FR - Pêcher
CZ - Broskev

Prunus persica var. Nucipersica
LV - Nektarīni
ENG - Nectarines
FR - Nectarinier
CZ - Nektarinka

Prunus sp.
LV - Ķirši
ENG - Cherry
FR - Cerisier
CZ - Třešeň

Pyrus communis
LV - Mājas bumbiere
ENG - Home pear
FR - Poirier domestique
CZ - Domácí hruška

Ribes nigrum
LV - Upenes
ENG - Blackcurrants
FR - Cassissier
CZ - Černý rybíz

Ribes rubrum
LV - Jāņogas
ENG - Redcurrant
FR - Groseillier
CZ - Rybíz

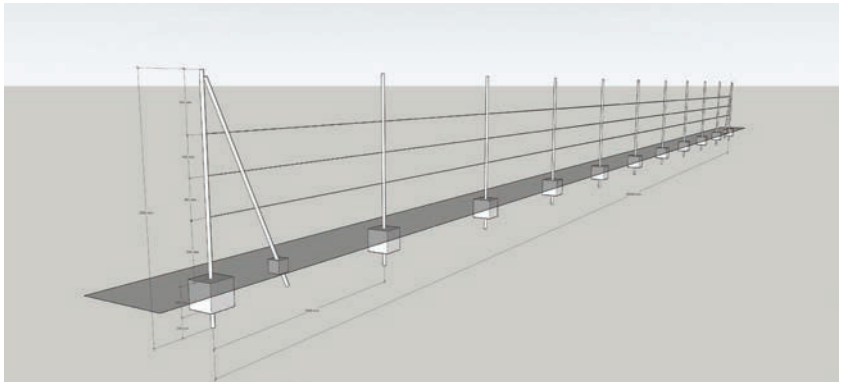
Ribes uva-crispa
LV - Ērkšķogas
ENG - Gooseberry
FR - Groseillier à maquereau
CZ - Angrešt srstka

Rubus caesius
LV - Kazenes
ENG - Blackberry
FR - Mûres
CZ - Ostružiník ježiník

Vitis sp.
LV - Vīnogas
ENG - Grapes
FR - Vigne
CZ - Réva vinná

Installation espalier step by step

1. First create working sketch.



2. Before planting trees and shrubs, prepare the planting site. Soil improvement and fertilization.

3. Dig the supports into the ground cement them vand pull out the horizontal wires with loops and tensioner.

4. On a wall - space between the horizontal wires around 30-40 cm apart with the first wire 50-60 cm above the ground, the wire should be tightened and secured. Free standing - place the posts 3 m apart and ~ 2 m above the ground and tightly string three wires between the posts with the first wire 50-60 cm above the ground and the others at 30-40 cm intervals.

5. Plant your tree in the middle of the horizontal wire framework and start training your tree. Use soft materials such as hessian, rubber or strips of fabric to tie the branches to the wires. The ties should be loose so not to restrict growth. Do not tie it with wire, this can cut into the bark on branches and damage the tree.

6. After planting, the soil is mulched. In winter, fruit trees are protected from frost and forest animals with agronet/ agrofilm.

Working materials

LV - Metāla stabi / Cinkoti stabi / Atbalsta stabi
ENG - Metal poles / Galvanised poles
Support poles
CZ - Kovové tyče/ Pozinkované sloupy / Podpěrné sloupy
FR - Poteaux metlliques / Poteaux galvanises
Poteaux de soutien

LV - Metāla stieple
ENG - Metel wire
CZ - Kovový drát
FR - Fil lisse métallique

LV - Savilcēji
ENG - Tensioners
CZ - Napínáky
FR - Tendeurs

LV - Āmurs
ENG - Hammer
CZ - Palice
FR - Massette

LV - Mērlenta
ENG - Measuring tape
CZ - Svinovací metr
FR - Mètre ruban

LV - Lāpsta, grābeklis
ENG - Spade,rake
CZ - Rýč,hrábě
FR - Bêche,Râteau

LV - Betona maisītājs
ENG - Concrete mixer
CZ - Míhačka betonu
FR - Bétonnière

LV - Plastmasas kaste
ENG - Plastic box
CZ - Plastový box
FR - Auge plastique

LV - Līmeņrādis
ENG - Level
CZ - Vodováha / libela
FR - Niveau

LV - Cements
ENG - Cement
CZ - Cement
FR - Ciment

LV - Šķembas
ENG - Chip/ Rubble
CZ - Štěrk
FR - Gravier

LV - Aukla
ENG - Cord
CZ - Šňůra / motouz
FR - Cordeau

LV - Augļu koku un krūmu stādi
ENG - Tree and shrub seed-lings
CZ - Sazenice stromů a keřů
FR - Plants d'arbres et d'arbustes

LV - Kultivātors/ zemes frēze
ENG - Cultivator
CZ - Kypřič / kultivátor
FR - Motobineuse

Installation and maintenance of lawns. Mechanical tools, different types of grasses.

Introduction

Turf management is a specialized field encompassing the establishment, care, and maintenance of various types of lawns. A well-established and maintained lawn contributes not only to aesthetic value but also to the ecological stability of the environment. This article focuses on different types of lawns, their establishment, suitable locations, and maintenance practices.

1. Ornamental Lawns
• Characteristics: Dense and fine grass with high aesthetic value.
• Usage: Gardens, parks, representative spaces.
• Example grass species: Red fescue, Kentucky bluegrass.

2. Utility Lawns
• Characteristics: Durable and less demanding to maintain.
• Usage: Gardens, sports fields, public spaces.
• Example grass species: Kentucky bluegrass, perennial ryegrass.

3.Sports Lawns
• Characteristics: Highly resistant to wear and regenerating.
• Usage: Football fields, golf courses.
• Example grass species: Perennial ryegrass, Kentucky bluegrass.

4. Technical and Erosion-Control Lawns
• Characteristics: Serve to protect soil and stabilize slopes.
• Usage: Road structures, industrial areas.
• Example grass species: Reed fescue, tall fescue.

Establishment of lawns

1. Soil Preparation
• Removing existing vegetation: Herbicides or mechanical removal.
• Terrain adjustment: Leveling the surface and removing stones.
• Soil improvement: Drainage, adding sand, compost, or fertilizers.

2. Sowing Lawns
• Seed selection: Based on the type of lawn and location.
• Seeding technique: Even sowing and incorporating seeds into the soil.
• Watering: Regular irrigation, especially during germination.

3. Laying Turf
• Advantages: Immediate effect, quick coverage.
• Procedure: Laying on prepared surface and thorough watering.

Suitable locations for lawns

1. Sunny Areas
• Recommended species: Kentucky bluegrass, perennial ryegrass.
• Maintenance: More frequent watering during dry periods.

2. Shaded Areas
• Recommended species: Red fescue, rough bluegrass.
• Maintenance: Less frequent mowing, regular aeration.

3. Sandy Soils
• Recommended species: Sheep fescue, Kentucky bluegrass.
• Maintenance: Improving soil structure by adding organic matter.

4. Wet Soils
• Recommended species: Bentgrass, reed fescue.
• Maintenance: Ensuring drainage and preventing waterlogging.

Lawn Maintenance

1. Irrigation
• Frequency: Depends on soil type and climatic conditions.
• Technique: Even watering in the morning or evening.

2. Fertilization
• Seasonal fertilization: Nitrogen fertilizers in spring, potassium and phosphorus in autumn.
• Organic fertilizers: Improving soil structure and microbial activity.

3. Mowing
• Cutting height: Varies by lawn type (ornamental 2-4 cm, sports 2-3 cm).
• Frequency: Regularly during the growing season.

4. Aeration
• Purpose: Removing moss and improving air access to roots.
• Methods: Manual or mechanical aerators.

5. Pest and Disease Control
• Prevention: Regular fertilization and maintenance.
• Intervention: Using fungicides or insecticides when problems occur.

Conclusion
Turf management requires a comprehensive approach, from proper establishment to regular maintenance. Selecting suitable grass species and techniques depends on site conditions and usage requirements. By following recommended practices, a healthy and aesthetically pleasing lawn can be achieved, serving its purpose over the long term.

Lawn plants

CZ - Bojínek lučn
ENG - Meadow cat's-tail
LV - Pļavas timotiņš
FR - Sauge commune

CZ - Kostřava luční
ENG - Meadow fescue
LV - Pļavas auzene
FR - Fétuque des près

CZ - Kostřava luční
ENG - Meadow fescue
LV - Pļavas auzene
FR - Fétuque des près

CZ - Kostřava luční
ENG - Meadow fescue
LV - Pļavas auzene
FR - Fétuque des près

CZ - Psárka luční
ENG - Meadow foxtail
LV - Pļavas lapsaste
FR - Vulpin des près

CZ - Srha laločnatá
ENG - Orchard grass/cat grass
LV - Parastā kamolzāle
FR - Dactyle Pélotonné

CZ - Pýr plazivý
ENG - Couch grass
LV - Ložņu vārpata
FR - Elymus repens

CZ - Jílek vytrvalý
ENG - Perennial ryegrass
LV - Daudzgadīgā airene
FR - Raigras anglais

CZ - Rákos obecný
ENG - Common reed
LV - Parastā niedre
FR - Roseau commun

CZ - Metlice trsnatá
ENG - Tufted hairgrass or tussock grass
LV - Parastā ciņusmilga
FR - Canche cespiteuse

CZ-Chundelka metlice
ENG-Windgrass
LV-Parastā rudzusmilga
FR-Agrostide Jouet du vent

CZ - Psineček obecný
ENG - Common bent
LV - Parastā smilga
FR - Agrostide commune

CZ - Zvonek rozkladitý
ENG - Spreading bell-flower
LV - Pļavas pulkstenīte
FR - Campanule étalée

CZ - Hrachor luční
ENG - Meadow vetchling
LV - Pļavas dedestiņa
FR - Gesse des prés

CZ - Chrpa modrá
ENG - Cornflower
LV - Zilā rudzupuķe
FR - Bleuet des champs

Mechanized Machines for Lawn Establishment and Maintenance

Lawn establishment and maintenance are key processes in creating high-quality and aesthetically valuable grassy areas. The use of mechanized machines greatly facilitates these processes, accelerates them, and ensures more precise results. Below are the main types of machines used in lawn establishment and maintenance.

1. Machines for Soil Surface Preparation

Preparing the soil surface is the first step in establishing a lawn.

• Rotavators: Used for breaking up and mixing the surface layer of soil. They are suitable for removing weeds and creating a fine substrate.

• Cultivators: Used for aerating the soil and preparing it for seeding. They are equipped with tines or disc blades.

• Rollers: Used for leveling the surface and compacting the soil to ensure better seed-to-soil contact.

2. Machines for Grass Seeding

Grass seeding is a critical step in lawn establishment. Proper seeding techniques can influence the density and quality of the grass cover.

• Seed Drills: Designed for evenly spreading grass seeds. Modern models allow for adjusting the desired seeding density.

• Spreaders: Used for manual or machine-based distribution of seeds over larger areas. They are also suitable for applying fertilizers or sand.

3. Irrigation Machines

Ensuring proper germination of seeds and grass growth requires effective irrigation techniques.

• Irrigation Systems: Automatic sprinkler systems provide even water distribution and can be programmed for different time intervals.

• Mobile Irrigators: Suitable for smaller areas or temporary use in various locations.

4. Machines for Mowing and Lawn Maintenance

Mowing is the most frequent maintenance task on lawns.

• Mowing Machines:

Reel Mowers: Provide precise and fine cuts, ideal for ornamental lawns.

Rotary Mowers: Versatile and used for most types of lawns.

• Verticutters: Remove dead grass, moss, and debris from the lawn surface, improving soil aeration.

• Aerators: Perform deep adjustments to the soil structure, enhancing water, air, and nutrient access to roots.

5. Machines for Fertilizing and Supplementary Maintenance

Fertilizing is essential for healthy grass growth.

• Fertilizer Spreaders: Ensure even distribution of fertilizers across the lawn.

• Topdressers: Used to apply sand mixtures or other materials to improve surface structure.

Conclusion

Mechanized machines for lawn establishment and maintenance are indispensable tools for both professionals and amateurs. Their proper use ensures fast, efficient, and high-quality work, leading to a healthy and attractive lawn.

How to lay the grass carpet

1. Soil preparation

Soil preparation before laying the grass carpet is similar to preparation before sowing the lawn. If there is an old lawn or other vegetation in the area, it is advisable to spray it with a total herbicide. After about two to three weeks, we can remove the old growth and then perform shallow loosening. For smaller areas, we can do it manually by shallow engraving (about 15 cm), for larger areas we can help with mechanization. Then we level the terrain and remove unwanted residues such as stones, etc. The area should be lower from the target state by about 2 cm due to the subsequent increase with grass carpet. It is ideal to leave the area prepared in this way for a while, e.g. after the rain has passed, for example, due to possible flattening. The lawn itself needs a minimum of 15 cm layer of high-quality, medium-heavy soil to grow well. If you have a plot with heavier soil, we recommend adding a layer of sand and incorporating it. For land with backfill or clay soil, it is worth considering whether to replace the top layer of 15 cm with quality soil. Just before laying, we recommend applying granulated fertilizer to the area.

2. Laying the turf

For more efficient work, we start laying parallel to the longer side of the plot. Before laying the turf, it is a good idea to slightly disturb the surface with a rake. We lay one belt to another, we push as close as possible to each other. The second row runs parallel to the first, but its beginning must be made in a different place than the first row (i.e. we tie it as when building a brick wall). Excess parts of carpets can be cut best with a sharp serrated knife, the resulting residues can be used in another place. The laid turf must now be rolled up and then immediately watered with a dose of water of at least 10-15 l/m. We then repeat watering according to the weather 1-3 times a day for at least 10 days after laying. Then gradually reduce the dose. The grass carpet must be laid within 24 hours of peeling off in the lawn nursery. If this is not possible, it is necessary to untangle the lawns in a shady place and irrigate. Basic rooting usually takes 10-14 days. During this time, it is necessary to keep the lawn moist and limit movement in the area to a minimum.

3. Aftercare

After 10-14 days after laying the turf, the first mowing is due. Before the first mowing, do not water the lawn for one day so that the area is not waterlogged. Always shorten the lawn by a maximum of 1/3 of its height (e.g. from 9 cm to 6 cm). Otherwise, we will cause a shock to the lawn, it will be harder to regenerate and look. We recommend mowing the lawn twice a week as optimal, once is sufficient in the summer months. The first fertilization can be done after the first mowing. The most suitable is the use of long-acting fertilizers, which can nourish the lawn for up to three months. With classic short-acting fertilizers, the nutrients in the lawn last a maximum of 6 weeks from application. We can use granulated fertilizers containing basic macroelements such as nitrogen (N), phosphorus (P), potassium (K), or microelements (S, Mg, Mn, B,..). The amount and ratio of nutrients changes throughout the year according to the lawn cycle.

Creation of roof top garden and bee friendly garden.

Extensive Green Roofs

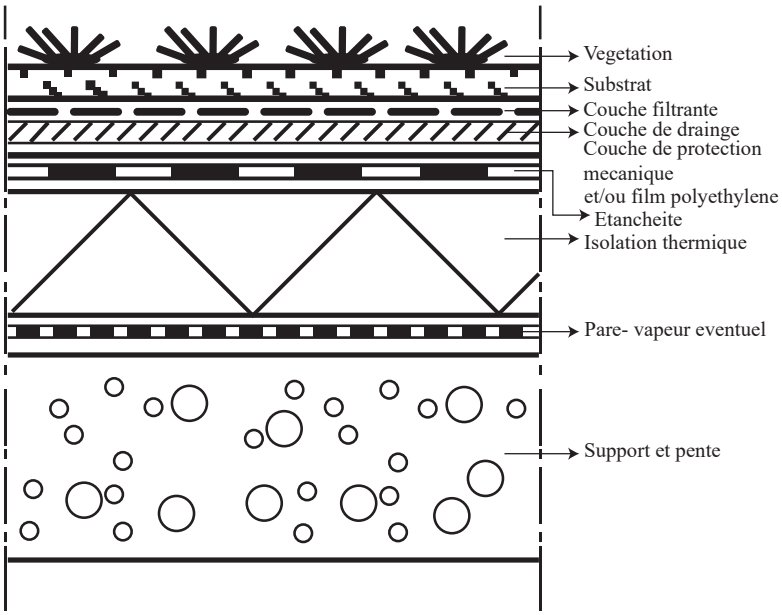
Creating an extensive green roof on our apiary to promote biodiversity and pollination through the integration of suitable nectar-producing plants.

Understanding Extensive Green Roofs

Definition-An extensive green roof is a green roofing system with a limited substrate thickness of 5 to 10 cm, meaning plant roots only require a thin layer of soil. This type of green roof can be installed on flat or sloped roofs and is suitable for both renovation and new construction projects. It is sometimes referred to as a "Sedum roof" because the vegetation mainly consists of Sedum or other succulents. This type of green roof is popular due to its relatively low cost.

What are the components of an extensive green roof?

While the components are theoretically simple, in practice they are more complex due to the wide variety of products available. To ensure optimal results and long-term protection of the building structure, the components must be carefully adapted to the technical conditions of the site (slope, exposure, etc.). Designers also prioritize the use of sustainable and/or recycled materials (e.g., EPDM membrane).



Special considerations for sloped roofs

Extensive green roofs are often installed on flat roofs but are also suitable for slopes up to 35°. Special anchoring systems are required for steeper slopes. Maintenance becomes more difficult above 10°.

- Slope < 10°: possible to install on smooth waterproofing (PVC)
- Slope 10°–20°: install rougher waterproofing (EPDM) or use anchoring systems (straps, battens, boards, grids, etc.)
- Slope > 30°: use specific retention systems, especially for granular materials
- Water content: gravity causes water to accumulate more at the base than at the top. Use this difference to select appropriate plants.

Two Methods for Building an Extensive Green Roof

These two solutions can be used separately or combined depending on your roof's needs.

Option 1: Hydropack® – All-in-One Pre-Grown Tray

A modular, ready-to-install system ideal for quick setup and instant results.

Key Features:

- Tray size: 60 × 40 × 9 cm, made of recycled HDPE
- Pre-grown vegetation (sedums or nectar-rich mix)
- Integrated substrate (6 cm), filter, and drainage layer
- Water reservoir: 8 L/m² + substrate retention: 24 L/m²
- Direct installation on waterproof membrane, no geotextile needed
- Interlocking trays with water flow between units
- Easily removable for waterproofing inspection

Advantages:

- Quick installation, no gardening skills required
- Instant vegetation coverage
- Wind-resistant
- Suitable for flat or sloped roofs up to 20%

Option 2: StockDrain 80 – Water Retention Panel + Custom Planting

A more customizable system, ideal for integrating your own nectar-producing plants.

Technical Features:

- Panel size: 58.8 × 38.8 cm, height 8 cm
- Water retention capacity: 30 mm (≈ 50 L/m²)
- 359 drainage holes/m² for fast water evacuation
- Multi-directional drainage
- Easy to install with handles and cutting guides

Advantages:

- High water retention and drainage
- Maintains substrate moisture
- Compatible with a wide variety of nectar-producing plants
- Optimized format for transport and installation

Which Method to Choose?

Criteria	Hydropack®	StockDrain 80 + Custom Planting
Vegetation Type	Pre-grown (sedums, mix)	Custom nectar-producing plants
Installation Ease	Very easy, fast	Moderately technical
Water Retention	32 l/m²	50 l/m²
Waterproofing Access	Removable	Not removable
Customization	Limited	Very high
Bee-Friendly	Yes (with nectar-rich mix)	Yes (custom plant selection)

Environmental Impact of StockDrain 80

- Sustainable Materials: Made from recycled HDPE, recyclable at end of life, low carbon footprint
- Water Management: 50 L/m² retention, reduces runoff, natural evaporation, stormwater buffer
- Biodiversity: Supports nectar-producing plants, enhances ecological resilience
- Optimized Logistics: Compact, lightweight (≈3 kg/m²), up to 228 m² per pallet

Environmental Impact of Hydropack®

- Eco-Design: Recycled HDPE trays, reusable and removable modular system
- Instant Vegetation: Pre-grown plants reduce erosion and dust immediately
- Water Efficiency: Combined retention of 32 L/m², reduced watering needs
- Other Benefits: Thermal and acoustic insulation, reduces urban heat islands

Summary Comparison

Criteria	StockDrain 80	Hydropack®
Material	Recycled PE	Recycled HDPE
Water Retention	50 l/m²	32 l/m²
Biodiversity	Very high (custom plants)	Medium to high (pre-grown mix)
Recyclability	Yes	Yes
Transport Footprint	Optimized (228 m²/pallet)	Good (modular)
Runoff Reduction	Excellent	Very good

Conclusion

Both systems are environmentally responsible, but StockDrain 80 offers greater flexibility for integrating local nectar-producing plants, making it ideal for a bee and pollination-focused project. Our choice: StockDrain, to allow free planting and student participation.

Installing an Extensive Green Roof

Location

The work area is located behind our new greenhouses. A 250 m² plot has been designated for an educational space on bees, currently featuring an apiary built by landscaping students.

Project Goals

During the seminar, students will landscape the area and install a green roof on the apiary.

Technical Details

1. Support: On the roof around the perimeter it is necessary to build wooden frame.
2. Waterproofing: After it, you put root-resistant EPDM membrane and geotextile.

Protection Layer:

- Protects waterproofing and partially stores water
- Use of RoofDrain ST12 drainage material.
- Installation: roll out with non-woven geotextile facing up, channels facing down along the slope.
- Overlap geotextile by ±10 cm.

3. Drainage Layer:

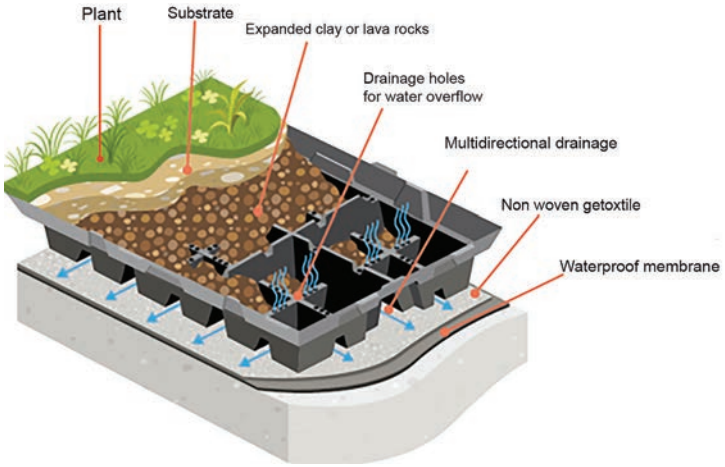
- Protects waterproofing and partially stores water
- Use of RoofDrain ST12 drainage material.
- Installation: roll out with non-woven geotextile facing up, channels facing down along the slope.
- Overlap geotextile by ±10 cm.

4. Substrate:

- DCM PEPI 3 mix
- Recommended thickness: 5–8 cm
- Less than 20% organic matter to limit weeds.

5. Installation:

- Introduction to StockDrain 80 panels.
- Fill the bottom of the panel with lava mulch for drainage.
- Cover with 8–10 cm of substrate.



6. Planting

- Select 5 different plants
- Criteria: drought, wind, and frost resistance; staggered blooming throughout the year
- Tip: Use roof slope to vary species by moisture needs (drier at top, wetter at base)
- Put the filled panels on the roof next to each other.

Teamwork: students research and plant flower beds around the area.

Step-by-step guide to creating a bee-friendly garden.

1. Plan the garden design, bed shape, and nectar plant assortment.

2. Dig the soil, form a flowerbed shape.

3. The beds are covered with textile material - geotextile.

4. Secure the geotextile with retaining pin.

5. Place plants accordingly to their height, texture and agroecological factors.

6. Drill holes in the geotextile where you are preparing to plant.

7. Start planting your selected plants.

8. Mulch around the plants.

9. You can add plant name cards.

Plant lists

The symbol in tables

Sun

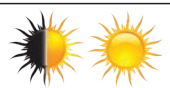
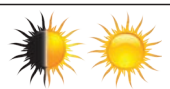
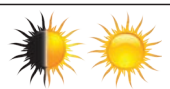
Half shadow

Dry / Ordinary

Moist / Medium

Wery well moist

Mediterranean plants (FR - Carpetras)

Nr.	Latin	Latvian	English	French	Czech	Shrub, tree or herb	Evergreen or deciduous	Humidity	Exposure	height	width	Flowering period	Flower color	Soil
1	Agapanthus	Āfrikas lilijas / agapanti	African lily	Agapanthe	Kalokvět	Herb	Deciduous			0.8m	0.80m	June/ August	Blue/ white	rich
2	Ballota pseudodictamnus	Ballota	False dittany	Faux dictamne	Měrnice diktamnovitá	Shrub	Evergreen			0.5 m	0.5m	End of June	Purple	dry
3	Cistus sp.	Akmensroze	Rockrose	Ciste	Cist (druh podle specifikace)	Shrub	Evergreen			1m	1.50m	June/ August	Pink/ white	dry
4	Cordyline australis	Dienvidu kordilīna	Cabbage tree	Cordyline	Kordylina jižní	Tree	Evergreen			3m	1m	June/ August	White	dry
5	Hedera helix	Eiropas efeja	Common ivy	Lierre grimpant	Břečťan popínavý	Shrub	Evergreen			2m	5m	July/August	White	ordinary
6	Helichrysum italicum	Itālijas salmene	Curry plant	Immortelle d'Italie	Smil italský	Shrub	Evergreen			0.4m	0.5m	August/ October	Yellow	dry
7	Lippia nodiflora	Paklāju lippija/ verbēna	Creeping vervain	Verveine nodiflore	Lippie uzlinatá (často jen latinsky)	Herb	Deciduous			0.15m	0.5	May/June	White	dry
8	Olea europeae	Eiropas olīvkoks	Olive tree	Olivier	Olivovník evropský	Tree	Evergreen			10m	3 m	May	White	dry
9	Perovskia atriplicifolia	Balodeņlapu perovskija	Afghan sage	Sauge d'Afghanistan	Perovskie lebedolistá	Shrub	Deciduous			1m	0.5m	June/September	Purple	ordinary
10	Salvia microphylla	dekoratīvā salvija	Graham's sage	Sauge de Graham	Šalvěj drobnolistá	Shrub	Evergreen			0.6m	0.6m	May/September	Red	ordinary/ dry
11	Sambucus nigra	Melnais plūškoks	Common elder	Sureau noir	Bez černý	Shrub	Evergreen			2m	3m	June/July	White	ordinary
12	Santolina chamaraypanisus	ciprešu santolīna	Cotton lavender	Santoline grise	Svatolina cypřiškovitá	Shrub	Evergreen			0.4m	0.5m	July/August	Yellow	Dry
13	Sedum acre	Kodīgais laimiņš	Biting stonecrop	Orpin âcre	Rozchodník hakonský	Herb	Evergreen			0.40m	0.50m	April/ October	Yellow	Ordinary
14	Teucrium hircanicum	Irānas embotiņš	Iranian germander Caucasian germander	Germandrée iranienne	Ožanka hyrkánská	Shrub	Deciduous			0.8m	0.3m	June/ October	Pink	Ordinary
15	Yucca filamentosa	Diegveida juka	Adam's needle/ Needle palm	Yucca filamenteux	Juka vláknitá	Shrub	Evergreen			3m		July/August	White	Dry

Ecological garden (FR - Guerande)

Nr	Latin	Latvian	English	French	Czech	Shrub, tree or herb	Evergreen or deciduous	Humidity	Expo-sure	Height	Width	Flow-ering period	Flower color	Soil
1.	Allium schoeno-prasum	Maurlloki	Chives	Ciboulette	Pažitka pobřežní	Herb	Evergren			0.3	0.25	may/june	pink	ordinary
2.	Aster alpinus	Alpu ziemastere	Alpine aster	Aster des Alpes	Hvězdnice alpská	Herb	Deciduous			0.25	0.4	may/june	purple	ordinary
3.	Aubrieta	Obrēta	Aubrieta	Aubriète	Tařička	Herb	Evergren			0.1	0.5	april/may	purple	dry
4.	Bergenia cordi-folia	Sirdslapu bergēnija	Heartleaf Bergenia	Bergénie à feuilles charnues	Bergenie srdčitolistá	Herb	Evergren			0.4	0.6	march/april	pink	moist
5.	Calendula offic-inalis	Ārstniecības kliņģerīte	Pot marigold	Souci officinal	Měsíček lékařský	Herb	Deciduous			0.4	0.5	june/ october	orange	medium moist
6.	Calluna vulgaris	Parastais virsis	Heather	Bruyère d'été	Vřes obecný	Shrub	Evergren			0.65	0.7	july / october	purple	acid/me-dium
7.	Clematis armandii	Armandi mežvītenis	Armand clematis	Clématite d'Armand	Plamének Armandův	Shrub	Evergren			7	5	march/april	white	well drain
8.	Crocus vernus	Pavasara krokuss	Spring crocus	Crocus de printemps	Šafrán jarní	Herb	Deciduous			0.1	0.1	february / april	purple	medium
9.	Erigeron karvinskianus	Karvinska jānītis	Mexican fleabane	Vergerette de Karwinski	Turan Karvinského	Herb	Evergren			0.25	0.6	may / october	white	medium
10.	Geranium san-guineum	Asinssārtā gangrene	Bloody crane's-bill	Géranium sanguin	Kakost krvavý	Herb	Deciduous			0.3	0.5	may / sep-tember	pink	moist/ well drain
11.	Hedera helix	Eiropas efeja	Common ivy	Lierre grimpant	Břečťan popínavý	Climbing	Evergren			21	6	september/ october	yellow	moist
12.	Lavandula angus-tifolia	Šaurlapu lavanda	English lavender	Lavande vraie Lierre grimpant	Levandule lékařská	Shrub	Evergren			0.75	1.1	june/ july	purple	dry
13.	Petasites pyrena-icus	Tūsklapes	Winter heliotrope	Pétasite des Pyrénées	Devětsil pyrenejský	Herb	Deciduous			0.3	1.2	january/ march	pink	moist/ well drain
14.	Salvia officinalis	Ārstnieciskā salvija	Common sage	Sauge officinale	Šalvěj lékařská	Shrub	Evergren			0.8	0.9	june/ july	blue	medium
15.	Sedum album	Baltais laimiņš	White stonecrop	Orpin blanc	Rozchodník bílý	Herb	Evergren			0.1	0.4	june/august	white	dry

Topiary plants (BE-Ciney)

Nr.	Latin	Latvian	English	French	Czech	Shrub, tree or herb	Evergreen or deciduous	Humidity	Exposure	height	width	Flowering period	Flower color	Soil
1	Buxus sempervirens	Mūžzaļais buksis	Common box	Buis commun	Zimostráz vždyzelený	Tree	Evergreen			1m	1m	End of june	White	Dry
2	Carpinus betulus	Parastais skabārdis	Common hornbeam	Charme commun	Habr obecny	Tree	Deciduous			15m	8m	May	Yellow	Ordinary
3	Chamaecyparis obtuse	Strupzvīņu paciprese	Hinoki cypress	Cyprès du Japon	Cypřišek tupolistý	Tree	Evergreen			5m	1.5m	–	–	Well drained
4	Euonymus japonicus	Japānas segliņš	Japanese spindle	Fusain du Japon	Japonský brslen	Shrub	Perenial/ evergreen			3m	2m	May/june	white/ green	dry
5	Hedera helix	Eiropas efeja	Common ivy	Lierre grimpant	Břečťan popínavý	Climbing	Evergreen			21m	6m	September / october	Yellow	ordinary
6	Ilex aquifolium	Aslapu ilekss	Common holly	Houx commun	Cesmína ostrolistá	Tree	Perenial/ evergreen			10m	5m	May/ June	White	dry
7	Ilex crenata	Japānas ilekss	Japanese holly	Houx crenele	Cesmína ostrolistá	Shrub	Perenial/ evergreen			2m	1m	May/ June	White	Ordinary
8	Juniperus squamata	Zvīņainais kadiķis	Flaky juniper	Genévrier écailleux	Jalovec šupinatý	Shrub	Evergreen			2m	1.5m	–	–	Moist/ Well drained
9	Larix kaemmpferi	Japānas lapegle	Japanese larch	Mélèze du Japon	Modřín japonský	Tree	Deciduous			10m	2m	–	–	Ordinary
10	Ligustrum vulgare	Parastais ligustrs	Common privet	Troene commun	Ptačí zob obecný	Shrub				3m	2m	June	White	Ordinary
11	Lonicera nitida	Spožlapu sausserdis	Shrubby honeysuckle	chevrefeuille arbustif	Zimolez leský	Shrub	Perenial/ evergreen			2m	2m	April/ May	White	Ordinary
12	Taxus baccata	Parastā īve	Common yew	l`if commun	Tis červený	Tree	Perenial/ evergreen			15m	8m	April	Yellow	Ordinary
13	Thuja occidentalis	Rietumu tūja	White cedar	Thuja occidentalis	Zerav západní	Tree	Evergreen			10m	1-2m	–	–	Ordinary
14	Viburnum tinus	Laurlapu irbene	Laurustinus	Laurier tin	Kalina modroplodá	Shrub	Perenial/ evergreen			2.5m	2m	October/ january	White/pink	Ordinary

Friut trees and shrub for espaliers (LV - Bulduri)

Nr.	Latin	Latvian	English	French	Czech	Shrub, tree or herb	Evergreen or deciduous	Humidity	Exposure	height	width	Flowering period	Flower color	Soil
1	Aronia melanocarpa	Aronijas	Aronia berries	Baies d'aronia	Aronie	Shrub	Deciduous			2-3	2-3	may	white	ph 6-6,5
2	Cornus mas	Kizils	European cornel	Cornouiller mâle	Dří obecný	Shrub	Deciduous			4-5	3-4	april	yellow	ph 6-6,5
3	Ficus carica	Vīģes	Figs	Figuier	Fíkovník obecný	Shrub/ tree	Deciduous			3-5	2-3	may	green	ph 6
4	Malus domestica.	Mājas ābele	Home apple tree	Pommier domestique	Domácí jabloň	Fruit tree	Deciduous			3-10	3-5	may	white/pink	ph 5,7-6,3
5	Prunus armeniaca	Aprikozes	Apricots	Abricotier	Meruňka	Fruit tree	Deciduous			6-10	4-6	april	pink	ph 7,5-8
6	Prunus avium	Saldie ķirši	Sweet cherries	Meurisier	Třešeň ptačí	Fruit tree	Deciduous			3-15	3-4	april/ may	white	ph 6-6,5
7	Prunus persica sp	Persiki	Peaches	Pêcher	Broskev	Fruit tree	Deciduous			5-6	3-4	april	pink	ph 6
8	Prunus persica var. Nucipersica	Nektarīni	Nectarines	Nectarinier	Nektarinka	Fruit tree	Deciduous			3-5	2-3	march/ april	pink	ph 5,5-6,5
9	Prunus sp.	Ķirši	Cherry	Cerisier	Třešeň	Fruit tree	Deciduous			3-4	3-4	april/may	white	ph 6-6,5
10	Pyrus communis	Mājas bumbiere	Home pear	Poirier domestique	Domácí hruška	Fruit tree	Deciduous			3-15	3-5	may	white	ph 5,7-6,3
11	Ribes nigrum	Upenes	Blackcurrants	Cassissier	Černý rybíz	Shrub	Deciduous			1-1,5	1	may	green	ph 6-6,5
12	Ribes rubrum	Jāņogas	Redcurrant	Groseillier	Rybíz	Shrub	Deciduous			1-2	1	may	white/ green	ph 6-6,5
13	Ribes uva-crispa	Ērkšķogas	Gooseberry	Groseillier à maquereau	Angrešt srstka	Shrub	Deciduous			1-1,5	1	may	green	ph 5,5-6,5
14	Rubus caesius	Kazenes	Blackberry	Mûres	Ostružiník ježiník	Shrub	Deciduous			1,5-3	2	may	white	ph 6,5
15	Vitis sp.	Vīnogas	Grapes	Vigne	Réva vinná	Shrub	Deciduous			3-10	3	may	green	ph 5,5-6,5

Lawn plants (CZ - Rajhrad)

Nr.	Latin	Latvian	English	French	Czech	Shrub, tree or herb	Evergreen or deciduous	Humidity	Exposure	height	width	Flowering period	Flower color	Soil
1	Phleum pratense	Pļavas timotiņš	Timothy grass	Bojin d'herbe	Bojínek luční	herb	evergreen			1 m	0,5-1 cm	June-August	gray-green	6-7 pH
2	Festuca pratensis	Pļavas auzene	Meadow fescue	Fétuque des prés	Kostřava luční	herb	evergreen			1-1,2 m	0,5cm	June-August	green	6-7,5 pH
3	Poa pratensis	Pļavas skarene	Common meadow-grass	Pâturin des prés	Lipnice luční	herb	evergreen			1-1,2 m	0,5 cm	May-August	jellou-brown	6-7 pH
4	Alopecurus pratensis	Pļavas lapsaste	Meadow foxtail	Alopecure des prés	Psárka luční	herb	evergreen			0,7 m	0,5-1 cm	June-July	gray-green	5,5-7,4 pH
5	Dactylis glomerata	Parastā kamolzāle	Orchard grass	Dactyle en touffe	Srha laločnatá	herb	evergreen			1,5 m	0,4-1 cm	May-July	gray-green, red	5-7 pH
6	Lolium perenne	Daudzgadīgā airene	Perennial rye grass	Ray-grass vivace	Jílek vytrvalý	herb	evergreen			0,1-0,6 m	0,6 cm	May-October	green	5,5-7 pH
7	Elytrigia repens	Ložņu vārpata	Couch grass	Agropyre rampant	Pýr plazivý	herb	evergreen			1,2-1,5 m	0,1 cm	June-August	green	4-7,5 pH
8	Phragmites australis	Parastā niedre	Common reed	Roseau commun	Rákos obecný	herb	evergreen			2 m	0,6-5 cm	July-September	red-brown	4-7,5 pH
9	Deschampsia cespitosa	Parastā ciņusmilga	Tufted hairgrass	Deschampsie en touffe	Metlice trsnatá	herb	evergreen			0,3 - 2 m	0,1 cm	June-August	green, jellow	5-7 pH
10	Apera spica-venti	Parastā rudzusmilga	Common wind-grass	Chondrille à épillets	Chundelka metlice	herb	evergreen			0,3 - 1,3 m	0,3-1 cm	June-September	green - purple	5,5-6,5 pH
11	Agrostis capillaris	Parastā smilga	Common bent	Agrostide capillaire	Psineček obecný	herb	evergreen			0,1 - 0,8 m	0,4 cm	June-August	green, brown, reddish	5-6,5 pH
12	Setaria viridis	Zaļā sarene	Green foxtail	Panic érigé	Bér zelený	herb	evergreen			0,2-0,6 m	0,1 cm	July-October	green,-purple	5,5-7 pH
13	Campanula patula	Pļavas pulkstenīte	Spreading bellflower	Campanule étalée	Zvonek rozkladitý	herb	evergreen			0,25-0,6 m	0,15-0,4 cm	May-September	violet	5,5-7 pH
14	Lathyrus pratensis	Pļavas dedestiņa	Meadow vetchling	Gesse des prés	Hrachor luční	herb	evergreen			0,4 - 1 m	0,12 cm	June-August	jellow	4,4 - 8 pH
15	Centaurea cyanus	Zilā rudzupuķe	Cornflower	Bleuet des champs	Chrpa modrá	herb	annual plant			0,8 m	0,2 cm	June-September	blue, white, violet	6,5-7,5 pH

Plants for green roof and nectar plants (BE - Liege)

Nr.	Latin	Latvian	English	French	Czech	Shrub, tree or herb	Ever-green or decidu-ous	Humidity	Expo-sure	height	width	Flowering period	Flower color	Soil
1	Armeria maritima	Jūrmalas armēri-ja	Sea Thrift	Gazon d'Es-pagne	Trávnička přímořská	herb	Ever-green			15 cm	30 cm	May - June	Pink	Sandy, well-drained
2	Campanula persici-folia	Dižā pulkstenīte	Peach-leaved bellflower	Campanule à feuilles de pêcher	Zvonek broskvolistý	herb	Decidu-ous			60–90 cm	30 cm	June - Au-gust	Light blue	Ordinary, well-drained
3	Ceanothus thyrsiflorus	Pušķainais ceanots	Blueblossom	Céanothe à thyrses	Latnatec kyt-kokvětý	shrub	Ever-green			50–100 cm	150 cm	May - June	Blue	Dry, poor
4	Cornus sanguinea	Asinssarkanais grimonis	Common Dog-wood	Cornouiller sanguin	Svída krvavá	tree	Decidu-ous			150–200 cm	200 cm	May - June	White	Rich, moist
5	Echinacea purpurea	Purpura ehināci-ja	Purple cone-flower	Échinacée pourpre	Třapatkovka nachová	herb	Decidu-ous			70–100 cm	45 cm	July - Sep-tember	White	Ordinary, well-drained
6	Hypericum densiflo-rum	Atvasainā asinszāle	Bushy St. John's Wort	Millepertuis dense	Třezalka hus-tokvětá	herb	Decidu-ous			90–120 cm	60–90 cm	June - Au-gust	Yellow	Ordinary, well-drained
7	Phlox subulata	Aslapu floksis	Creeping phlox	Phlox subulé	Plamenka šíd-lovitá	herb	Ever-green			10–15 cm	30–60 cm	April - May	Lavender blue	Sandy, well-drained
8	Rudbeckia fulgida	Krāšņā rudbekija	Orange cone-flower	Rudbeckie brillante	Třapatka zářivá	herb	Decidu-ous			60–90 cm	45–60 cm	July - Sep-tember	Yellow	Ordinary
9	Saxifraga x arendsii	Ārendsa ak-meņlauzīte	Arends' Saxi-frage	Saxifrage d'Ar-ends	Lomikámen Arendsův	herb	Ever-green			10–15 cm	30 cm	April - June	White	Humus-rich, well-drained
10	Sedum reflexum	Atliektais laim-iņš	Reflexed stone-crop	Orpin réfléchi	Rozchodník skalní	herb	Ever-green			15–20 cm	30–45 cm	June - July	Yellow	Dry, poor
11	Sedum spathulifolium	Lāpstveida laimiņš	Broadleaf stonecrop	Orpin à feuilles spatulées	Rozchodník lžíčkolistý	herb	Ever-green			10–15 cm	30–45 cm	May - June	Pale yel-low	Rocky, sandy
12	Sedum spectabile	Izskatīgais laim-iņš	Showy stone-crop	Grand orpin	Rozchodníkovec nádherný	herb	Decidu-ous			30–50 cm	40 cm	August - September	White	Ordinary, well-drained
13	Stachys byzantina	Vilnainā sār-mene	Lamb's Ear	Oreilles d'ours	Čistec vlnatý	herb	Semi-ev-ergreen			20–30 cm	45 cm	June - Au-gust	Silvery purple	Dry, poor
14	Thymus citriodorus	Smaržīgais cit-rontimiāns	Lemon Thyme	Thym citron doré	Mateřídouška citronová	shrub	Ever-green			20–30 cm	30 cm	June - Au-gust	Light pink	Sandy, well-drained
15	Viburnum opulus	Parastā irbene	Guelder rose	Viorne Boule de Neige	Kalina obecná	tree	Decidu-ous			200–300 cm	250–300 cm	May - June	White	Humus-rich, moist

Bulduru Tehnikums

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