CityZen
Interreg Europe

European Union
European Regional
Development Fund

DO IT YORSELF A VERTICAL GARDEN FOR URBAN FARMING

The CityZen project is funded by the INTERREG Europe Programme and co-financed by the ERDF.

sofia development association
асоциация за развитие на софия

ARC FUND

ЗЕЛЕНА СОФИЯ
столична община

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The CityZen project is funded under the INTERREG EUROPE and co-financed by the ERDF (EU).

CityZen pilot action directs the attention of public, scientific and business organizations in Bulgaria towards urban agriculture issues, innovation and good practices that can be applied.

https://www.interregeurope.eu/cityzen/

ABSTRACT

The DIY Vertical Urban Farming Garden Manual aims to raise the awareness of urban farming and provide step-by-step instruction in support to potential users to try it on in their homes, offices, common areas of residential buildings or else.

The manual takes you through the entire process: from the benefits and challenges of having an indoor vertical garden to detailed manuals for creating a physical structure to planting guide, care and more.

There are four options for physical structures proposed, all of which developed through a design process with users and tested for a period of 3 months in different locations in Sofia. The structures are free standing, using different sustainable materials, appropriate for diverse interiors, thus allowing you to choose a design in line with your space and taste.

The manual provides instructions for soils, drainage and watering. Citizens of Sofia can benefit from the municipal program to receive 10 l compost annually if you show you have paid your local taxes.

You can also see our suggestions what crops are appropriate for year-round urban farming, varying from herbs and spices, to fruit and vegetables, to sprouts and microplants.

You can also find valuable advice on how to maintain your urban garden, as well as recommendations for further readings or joining communities of urban farmers.

The manual is developed by Sofia Development Association in the framework of CityZen project funded by the INTERREG EUROPE programme, co-funded by EU's ERDF.

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Directions

Did you know, that we spend 90% of our life indoors? This fact should prompt us to create a healthy work and residential environment, not only interior aesthetics.

Vertical gardens give us an opportunity to incorporate nature in our living space, to create a soothing surroundings with visual relationship to nature and to shorten the path from the production of food to table.

Therefore their popularity increases continuously. If you look for **hashtag #verticalgarden in Instagram**, you will find more than **208,000 posts**! Apart all benefits, vertical gardens look fantastic!

What is vertical garden

The vertical garden is a construction to grow plants in height that uses airspace, walls or ceilings. It can be self-standing, attached to a wall or suspended in a ceiling or wall. Plants that are grown in pots and containers, can be moved easily but occupy more space and require more care. Vertical gardens are great alternatives for smaller spaces as they increase repeatedly the area to grow plants.

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Benefits of vertical gardens

Vertical gardens do not just look good, they can improve our overall quality of life. They help:

- Better air quality. Plants are natural air purifiers.
- Aesthetizing space.
- Maximum use of space.
- Better quality of vegetables, spices and herbs raised in the convenience of your home or office.
- Reduce noise. Plants absorb part of the noise pollution in the room.
- Better temperature balance. Vertical installations slow down the cooling or heating of inner walls, especially in summer.
- Improving mood. Gardening activities reduce stress and improve self-esteem. Green is one of the most relaxing colors that helps to release energy and increases productivity.
- Healthier life. People engaged with gardening are 36% less likely to develop dementia.
- Encourage people to be creative and responsible.
- Gives an alternative to traditional cultivation. The future of agriculture may be in the city and not only in the remote areas and villages.

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HOW TO MAKE YOUR OWN SELF-STANDING VERTICAL GARDEN

We offer you 4 models for vertical gardens that are proven easy and affordable. They were created in the design workshops held on 11 and 18 October 2021 within the CityZen project, funded under the INTERREG EUROPE programme and co-funded by the EU ERDF. The materials used are durable, natural or recycled. Structures are free standing, that makes them suitable for different interiors without complicated installation and strengthening.

Choose a design that best suits your space and needs. Creating the structure may be fun. Use anything that you already have. Follow the **instructions** and you will have a successful project!

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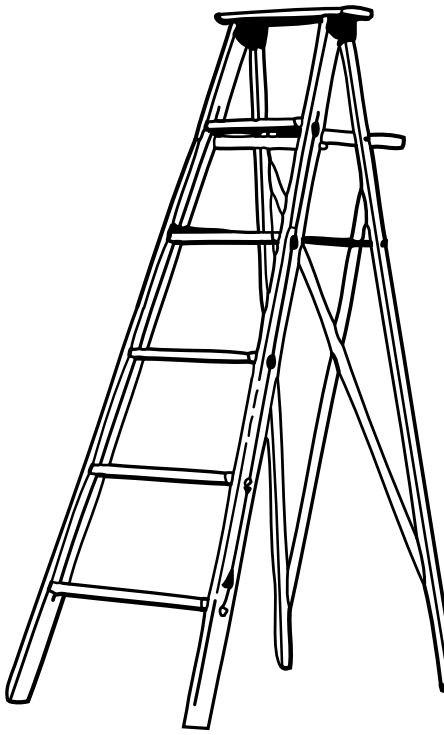
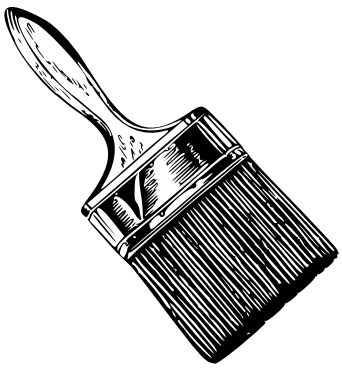
Small A-shaped vertical garden

1. Necessary materials



- 1 piece (pcs). wooden double sided ladder with 4 steps (132 cm)
- 5 pcs. wooden laths (46x600 mm)
- 6 pcs. wooden laths (46x800 mm)
- 5 pcs. wooden laths (60x100 mm)
- Painting tools (2 rollers, paint tray)
- Paint 1l. (optional color)
- 32 pcs. nails (screws)

2. Necessary tools



a. Brush
b. Roller
c. Paint tray
d. Hammer
e. Roulette
f. Pencil
g. Gloves
h. Nylons
i. Paint thinner

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3. Steps

1. Paint (optional color) the wooden ladder and all wooden laths

2. Measure and mark:

- determine the place of the laths on the ladder and the distance between laths

3. Nail (screw) the laths on the ladder by using nails and hammer or use drill and screws instead.

4. Final product - 132 cm A-shaped vertical garden

Technical scheme can be downloaded from **HERE**.

The construction is pilot tested at a **branch of the Sofia Library**.

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Large A-shaped vertical garden

1. Necessary materials

- 1 piece (pcs). wooden double sided ladder with 6 steps (192 cm)
- 11 pcs. wooden boards (100x25x1.8 cm)
- 6 pcs. wooden laths (50x25x1.8 cm)
- 24 pcs. nails (2-3 cm)
- 14 pcs. closed hooks

2. Necessary tools

a. Hammer

b. Handsaw (circular saw)

c. Roller tape measure

d. Right angle ruler

e. Drill

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3. Steps

a. Cut the wooden boards to 9 slats of 100 cm and 4 slats of 50 cm

b. Cut the wooden laths to 2 bars of 47cm and 8 bars of 20 cm

c. Measure the distance between the stairs on the inside of the ladder. Attach the bars to the slats so that they act as stoppers once placed over the stairs of the ladder. By putting the bars on the slats they have to enter the space between the stairs.

d. Nail the bars to the slats: the bottom line consists of 4 slats with a distance of 3 cm between each piece and 2 stopper bars of 47 cm. Next rows are formed by 2 slats with a distance of 2 cm between them and the use 20 cm stopper bars.

e. Assembled boards of slats are placed on the stairs of the ladder.

4. Final product

Technical scheme can be downloaded from **HERE**.

The construction is pilot tested at **Sofia Tech Park** and the **supermarket of the Central Cooperative Union**.

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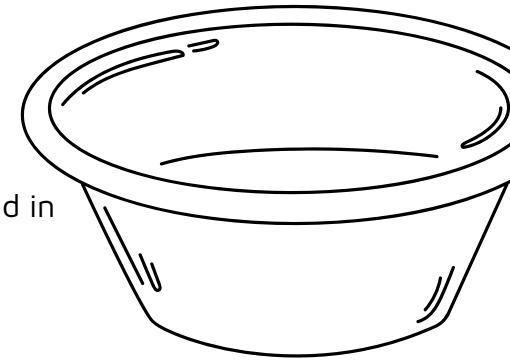
Vertical garden with recycled bottles

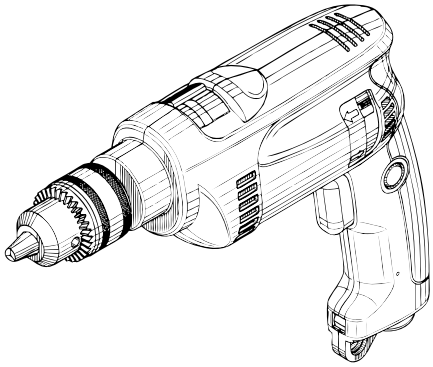
1. Necessary materials

- 1 piece (pc.). galvanized tube about 1.80 cm high
- 1 pc. oval trough (plastic or metal)
- 1 pc. an umbrella stand (plastic or metal)
- 6 pcs. bolts and nuts
- White and golden decoration spray (optional)
- 6 pcs. bottles of mineral water - we could recycle those we had in storage



2. Necessary tools

a. Used paper to protect our work place clean and unstained (recycling again)
b. 3D printer and computer
c. Carpentry pencil
d. Cutter knife
e. Scissors
f. Washing sponge
g. Drill



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3. Steps

a. Clean, cut and shape the mineral water bottles

b. Paint the oval through, if made of plastic (optional color)

c. Paint the mineral water bottles (optional color)

d. Size the tube at your discretion

e. Drill the galvanized tube

f. Place bolts and nuts in the tube of the specified places

g. Paint the galvanized tube

h. Put the painted and shaped bottles on the tube

i. Draw and 3D model a plug for the tube

j. Put the plug on the tube

4. Final product

The construction is pilot tested at **SofiaLab.**

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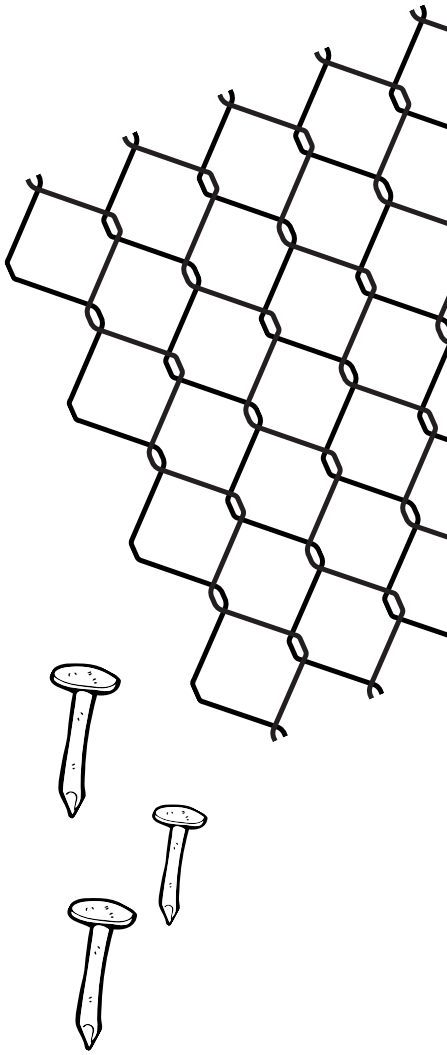
Vertical garden chest/box with a drawer

1. Necessary materials



- 5 pieces (pcs). slats/laths (2000x40x40 mm)
- 2 pcs. timbers/beams (3000x58x38 mm)
- OSB with size 2440x1220x11 mm
- 24 pcs. screws 5x70
- 100 pcs. screws 4x40
- 25 pcs. double nails (3,1x3,1 mm)
- reinforcement mesh (2000x1000 mm)
- 1.5 m thick foil (for waterproofing)

2. Necessary tools

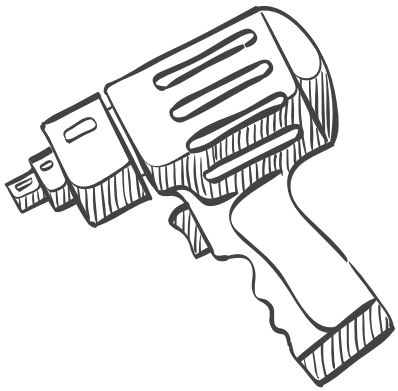
a. Screwdriver (powered)

b. Drill bit 4.5 mm

c. Bit

d. Right angle ruler

e. 2 pcs. clamps



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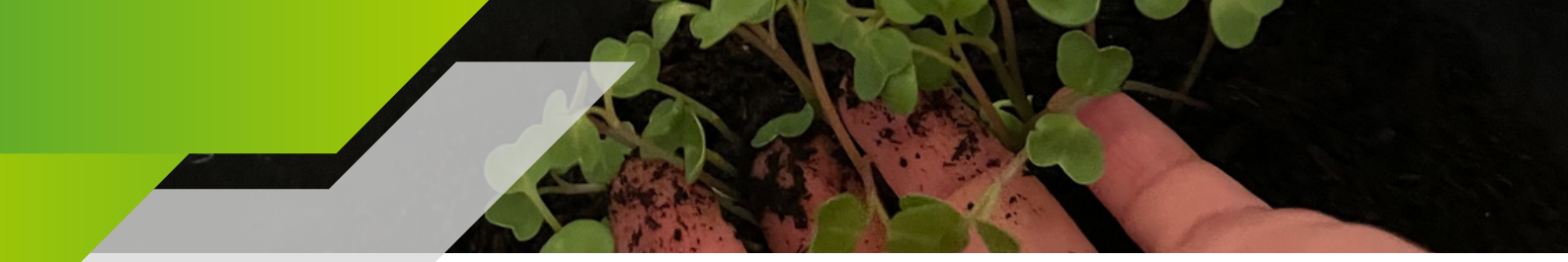
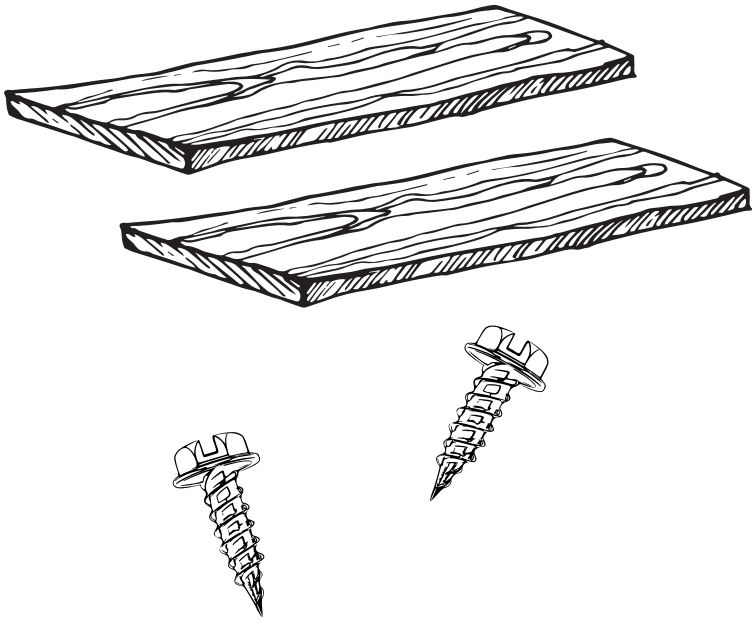


3. Steps:



a. The slats (laths) are cut into::

   i. 6 slats of 69.8 cm;

   ii. 4 slats of 65 cm;

   iii. 6 slats of 32 cm;

   iv. 4 slats of 13 cm

b. The beams (timbers) are cut into:

   i. 2 beams of 170 cm;

   ii. 1 beam of 80 cm.

c. The short sides of the chest/box are assembled with 4 slats of 65 cm, 6 slats of 32 cm and 12 screws 5x70.

d. The long sides of the structure are assembled with 6 slats of 69.8 cm and 12 screws 5x70.

e. OSB is cut and assembled to the structure with 2 clamps and 96 screws 4x40.

f. The drawer is assembled with 4 slats of 13 cm, OSB and 4x40 screws.

g. The frame is assembled and attached to the chest with 2 beams of 170 cm and 1 of 80 cm, reinforcement mesh, 14 screws 5x70 and 25 double nails.

h. The waterproofing is placed in the chest with a hammer, L-shaped nails and a model knife. When installing the waterproofing, keep in mind that the soil will stretch the foil, so it should be laid loosely.

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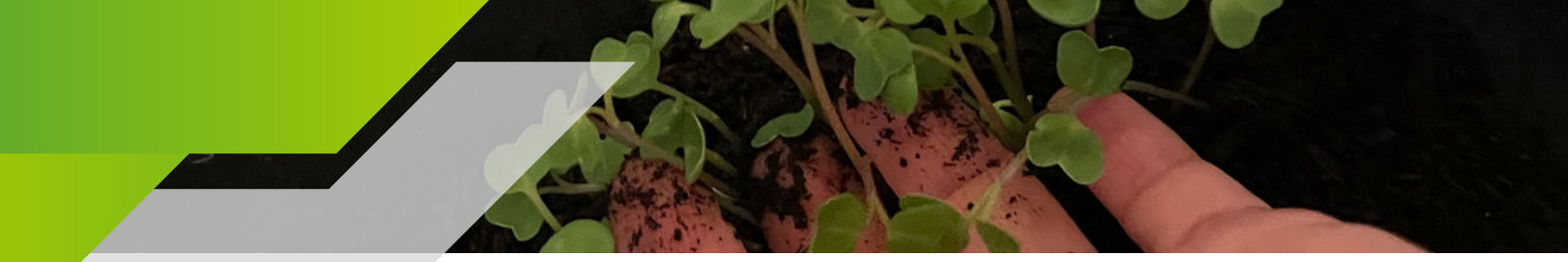
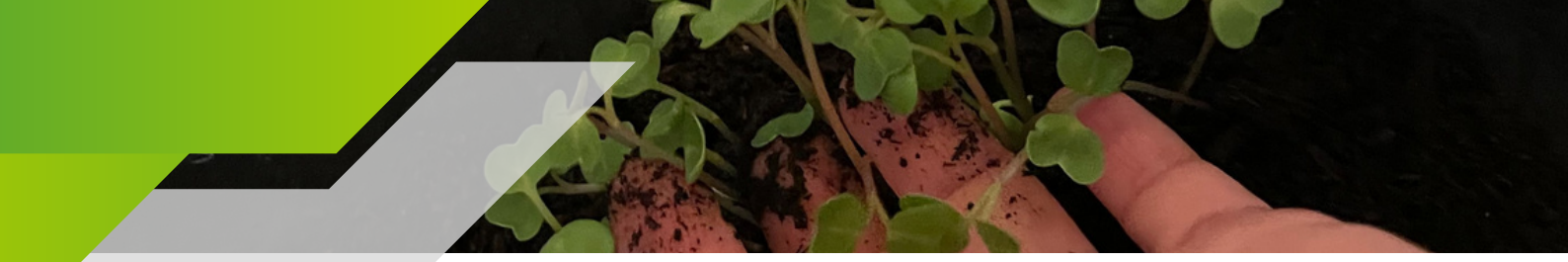


4. Final product – a vertical garden chest with drawer and frame

Technical scheme can be downloaded from **HERE**.

The construction is pilot tested at a **residential building in 'Iztok' district** and **at a premise of Sofia Municipality.**



Personal protective equipment:

- A specific place of work (for painting, cutting, drilling, cleaning, sizing, experimenting).
- Necessary gloves, appropriate clothing and footwear.

Tips:

- Shopping would take less time if you know what you need and where you can get it.
- You need a car to transport materials.
- Preparing the ground for work is necessary for your safety and ease of work.
- Depending on what you will grow, the depth of the bottles/ flowerpots is defined, so think about it in advance.
- Instead of nails and a hammer, a screwdriver and screws can be used for your convenience.

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Containers and soil

Almost anything can be used as a container: cans, kitchen utensils, recycled bottles... Just be sure to drill holes for drainage.

If the vertical garden design you choose has small hanging containers, make sure they are strong enough, but not too heavy for the construction.

As vertical gardens have limited drainage possibilities, it is very important to make a good drainage at the bottom of the pots. You can use small stones or other appropriate material for this purpose, because the roots of most plants rot in excessive moisture.

Once you have put in drainage, you can fill the containers with enriched soil or compost. The choice of soil depends on the design of the vertical garden and the type of plants you will grow. For hanging or high-lying containers, well-rotted compost is recommended because it is lighter and easily moisturized. If necessary, you can add a water-retaining gel or granules. For bigger pots in which vegetables with a larger root system will be grown, a mixture of enriched soil and compost is recommended. Do not use insufficient rotted manure to avoid burning plants. Fill with potting soil up to 5 cm from the edge of the container if it is straight, or up to 7 cm if it is sloping, because the compost is easily washed away when watering.

Every three years, remove all the soil to the drainage and enrich it with 20% compost or well-rotted natural fertilizer so that the vegetables continue to grow well.

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Every citizen of Sofia has the right to receive **10 liters of compost per year** from the municipal site for waste treatment in Khan Bogrov (https://bit.ly/3qZdTRo) **for free** in case of presenting a document for paid waste management fees for the current year. You can read more about it here: https://bit.ly/3F4GY3d.

Take advantage of it now!

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What crops grow well in vertical gardens

Choosing the right plants for you to grow is one of the first things in your to-do list. Different plants need different space, light and irrigation – keep it in mind.

Spices and herbs

If you want to have fresh spices on hand for your home cooked food, the vertical garden is the right solution! Growing herbs and spices is easy, beautiful and practical. In addition, they have a great scent and will aromatize your room space. Although most spices and herbs can be grown indoors, the most suitable one for growing in vertical gardens are:

-Basil
-Parsley
-Dill
-Lavender
-Mint
-Regan
-Wild onions
-Lemon balm
-Rosemary
-Salvia

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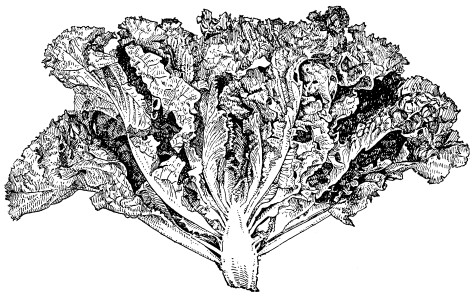
Fruits and vegetables

Most fruits and vegetables need a lot of light and heat to harvest. Those listed below perform well in indoor containers. You can grow them from ready-made seedlings or seeds - the latter is significantly cheaper, but takes more time.

- **Cherry tomatoes.** They do not take up as much space as other varieties. The seedlings are ready in about a month. They need at least 30-40 cm deep and wide container to have enough space for their roots. When they grow, they also need support for the stems. They are watered when the soil has lost its moisture.

- **Chilies (peppers).** Ornamental varieties of hot peppers are best suited for growing in pots, such as the Rox variety. It is specially designed for growing at home and is planted by seeds. It reaches only 35 cm in height, but carries up to 80 peppers. A pot with a hole diameter of about 15 cm at the top is needed for planting, and about 25 cm deep.

- **Leafy vegetables**: **lettuce, salads, spinach.** They grow well indoors and are easy to grow. They love light, but can be successfully grown in some shade. They prefer cooler temperatures.
They do not have a deep root system, so they can be grown in medium-sized pots and boxes. Each lettuce plant requires 10-15 cm of space and a depth of about 20 cm. Plant them every few days to have a regular harvest.



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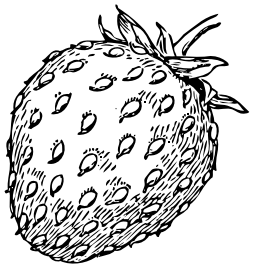
- **Root vegetables**: **carrots, radishes, garlic, onions.** It is an excellent choice for having indoor plants all year round. Radishes are very unpretentious and give a harvest in about 3-4 weeks. The optimum air temperature for them is 12-18 degrees, so they can be grown in foyers and glazed balconies. With excess heat and lack of solar light, the seedlings will grow quickly in height, but the roots will not form a fruit. Planting can be done every 2 weeks to ensure a regular harvest.

- **Strawberries.** Some varieties of strawberries yield throughout the year. Planted in pots, they are protected from contact with the ground and rot and are easy to pick. Strawberries also have a decorative effect. Watering is needed when the top layer dries. If there is enough light and heat, they will yield in the winter as well.



Sprouts and micro plants

Micro plants (micro greens) are in fact one of the healthiest forms of plants we eat. The concentration of nutrients in them is many times higher and they are literally living food - you pick from the root and eat at the moment. These are perfectly normal varieties of broccoli, sunflower, amaranth, radish, kale, fennel, basil, peas or other vegetables, just we do not wait for a large plant to grow, and it is consumed after it germinates. Depending on the variety, one plant grows enough for consumption for between 7 and 30 days. Some are watered more often, others less often. They should be consumed within one week after germination.

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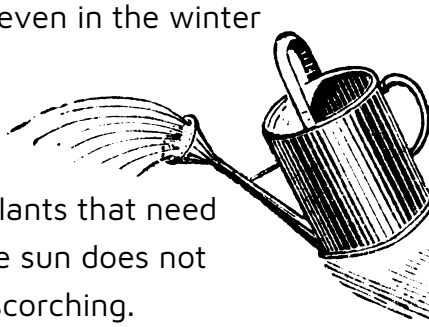
Maintenance of the vertical garden

Vertical gardens are much easier to maintain than ordinary horizontal gardens simply because of their indoor location (close to you) and the fact that you will fight fewer pests and plant diseases.

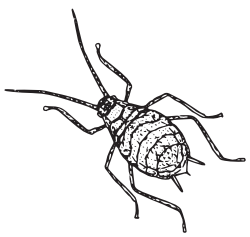
In order for plants to grow well indoors, they need enough **natural sun light**. Therefore, place the garden near a south window, so that even in the winter months it receives at least 6 hours of daylight.



Most plants need **regular watering**. It is good to combine plants that need the same amount of water. Water the plants only when the sun does not heat them directly, in the morning or evening, to prevent scorching.

Container plants have limited access to nutrients, so you need to **regularly feed and fertilize the soil**. Use organic fertilizers to limit the harmful chemicals that your plants have access to.

Although it is less common, indoor plants can also **suffer from pests**. Most often these are aphids, sciarid flies, mealworms, spider mites. Some of them can be removed manually, but it is still advisable to treat the plants with an organic pesticide to protect the space from damage.



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BECOME PART OF THE COMMUNITY OF URBAN GARDENERS AND FARMERS!

Visit:

- **A community/shared garden in Sofia**, Str. 35 Todor Kozhuharov, on a plot of land that has been used for unregulated parking for years before. It was established by the "Gorichka" Association in 2019 as a demonstration city vegetable garden. Meet the volunteers.

- **A "Garden for Druzhba"**, on Deliyska Vodenitsa Str, which covers an area of 6 decares and consists of over 50 gardens divided into plots. The garden was created by the "Free Center with a horizontal structure for Urban Gardening - Sofia".

- **A community/shared garden – "German"** spreads over 5 decares and consists of several gardens with a larger area. The garden was created by the "Free Center with a horizontal structure for Urban Gardening - Sofia".

- **A community/shared garden – "East"**, which is located on the territory of Sofia Professional High School Princess Evdokia. The garden was created by the "Free Center with a horizontal structure for Urban Gardening - Sofia".

- **Vitosha Bio Garden**, located in Vitosha district, next to building No 18. The farmers are a group of enthusiasts from the neighborhood and the whole city.

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If you live in the capital city Sofia and want to learn more about urban farming and exchange experience, you can join the following groups and Facebook pages:

- **„Градско земеделие в София“** / Urban farming in Sofia
- **„Градско градинарство – София** / Urban gardening – Sofia
- **Център за градско земеделие** / Center for urban farming
- **Вкусната образователна градинка** / Tasty garden
- **Градско градинарско царство** / Urban gardening kingdom

You will also find useful information in the following resources:

- A Guide to creating a community/shared garden
- Learning by doing guide - the “Tasty Garden”
- Compost at home – urban experimentalum

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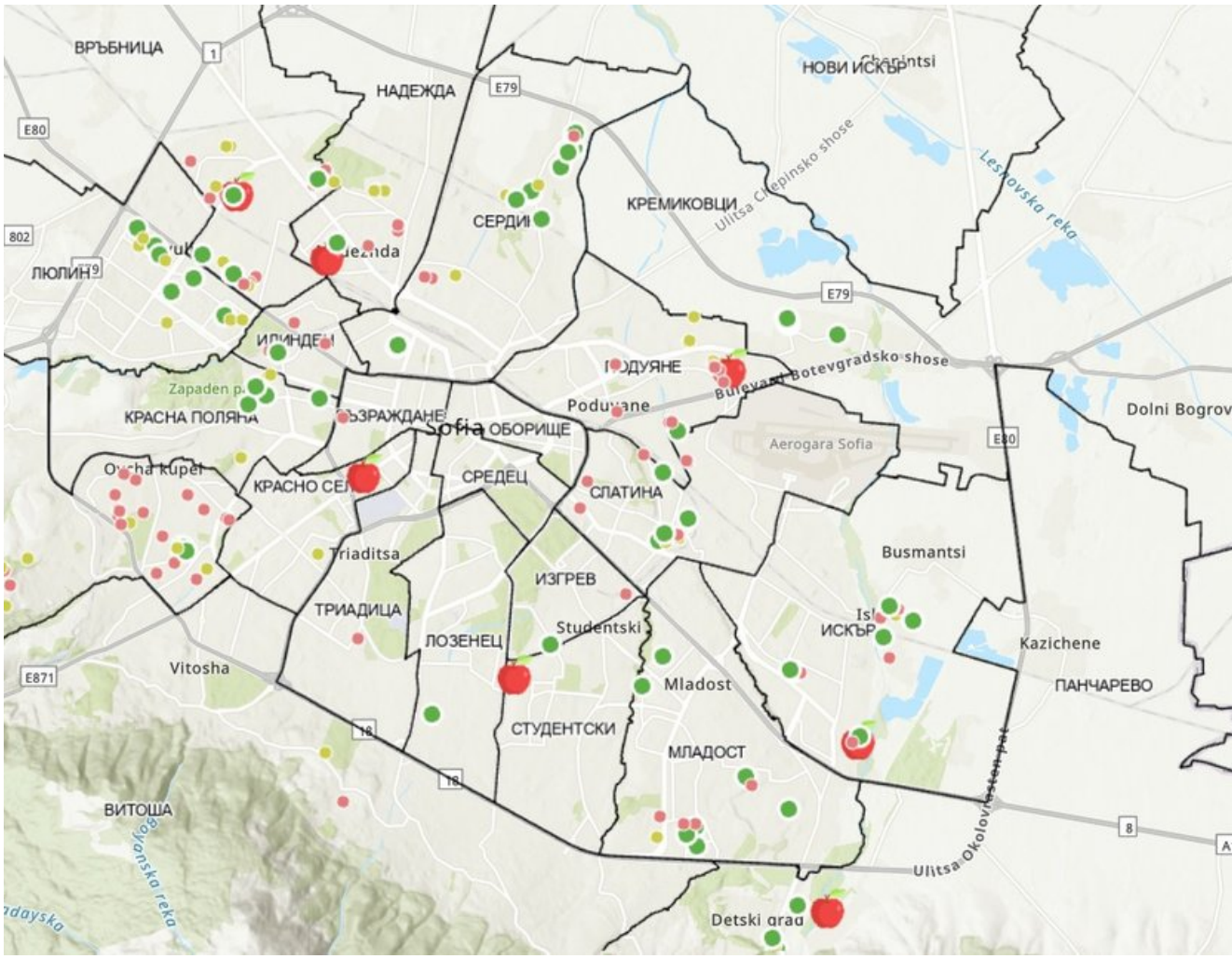
Map of the possible terrains for the development of urban farming within the city of Sofia



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The map was prepared by OP Sofiaplan.

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