STARTING A BUSINESS BY SETTING UP A GREENHOUSE FOR GROWING ORNAMENTAL PLANTS

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ABSTRACT: The establishment of a greenhouse for the cultivation of ornamental plants arose due to the many advantages that greenhouse cultivation offers. Starting a business in the field of ornamental plant cultivation consists in setting up a greenhouse with an area of 160 m2 (20 x 8 m) in the village of Leleşti, Leleşti commune, Gorj county. Inside the greenhouse there will be 3 rows of cultivation tables of 18 m each, on which 3000 pots will be produced, plus 400 pots with hanging pots. Six plants species will be grown.

KEY WORDS: business, greenhouse, ornamental plants

1. INTRODUCTION

In recent decades, the cultivation of flowers has expanded significantly, in most countries becoming one of the most profitable branches of crop production. The cultivation of ornamental plants, through their role in human life and society, fulfills four major functions:

- aesthetic function - the ability of flowers to satisfy the human need for beauty;- health function

- the role of floral plants in maintaining air balance and their beneficial effects on human mental health- the socio-human function - the impact flowers have on the development of human relationships;

- economic function - the significant income that the cultivation and marketing of flowers brings to those involved in the industry. This includes the impact on tourism, as well as through the use of floral plants as raw material for various industries.

In the context of Romania, the floriculture sector has experienced significant growth. Today, a wide range of ornamental species are cultivated. Of the total of about 12,000 cultivated species, about 3,000 are intended for food consumption, a small proportion are used in industry and the majority are considered ornamental plants.

The biological and ecological characteristics of cultivated ornamental plants are:

Bougainvillea is characterized as a shrub or vine, with long shoots provided with thorns. The leaves are oval-elliptical and deep green in color. The flowers are small, creamy-white flowers of limited decorative value, but are surrounded by an involucre of persistent bracts that remain visible for an extended period of the warm season. These bracts are particularly attractive, showing vibrant colors such as red, pink, lilac or orange. (fig. 1.)

It is a plant with specific light and water requirements. This plant is characterized by the need for generous watering in summer, in contrast to winter, when watering needs to be moderate. This species also prefers light substrates with a slightly acidic pH.

Hibiscus rosa-sinensis L. (Chinese rose, Japanese rose) grows as a more or less branched shrub, reaching heights of about 1.5-2 m. The leaves are oval or rhombic-oval in shape, with more or less serrated margins, expressing an intense green coloration and a glossy texture. The flowers are characterized by a broadly open funnel shape, either single or involute, showing a variety of colors such as red, pink, yellow, white, orange, pink, white, orange and purple. The stamens and

pistil are prominent and extend beyond the corolla. (Fig. 2.)

This species requires intense light exposure and constant watering during the growing season. On hot summer days, shading is necessary to protect the plants from excessive heat. The optimum temperature for flowering is 20 °C. The quality of the substrate should be of importance; it should be slightly humus-rich and have a slightly acidic pH as well as being well drained.



Fig. 1. *Bougainvillea*



Fig. 2. *Hibiscus rosa-sinensis*

Chlorophytum comosum Bak. (bridal veil, flying Dutchman's-wort, spider plant), the most notable and widespread species in cultivation (fig.3.)

The plant adopts a compact form, consisting of linear leaves with pointed tips, characterized by distinct grooves and an elegant arching, up to 40-50 cm long. These leaves are a variety of shades of green, sometimes showing alternating green patterns with white or cream.

A less fussy plant, it adapts well to environmental variations. It prefers semi-shade but can tolerate both shade and direct sun. During the warm season, optimal temperatures range from 18 to 20 degrees Celsius, while in winter the plants go into relative dormancy, requiring cooler temperatures and moderate watering.

Also, a crucial aspect in caring for the species is to avoid overwatering, which can lead to rotting of the roots and the whole plant

Dipladenia is characterized by its flowers, where the morphology can range from a simple shape with five well-defined petals to double variants. The color diversity is remarkable, including intense shades of red, pink, white or yellow. The leaves are glossy, 10-13 cm long, lanceolate or oval. (fig.4.)

It is a species with specific light and watering requirements, requiring a well-lit environment and controlled sun exposure. In summer, the plant should be placed in direct sunlight but protected from excessive heat. The temperature should not fall below 10 °C in winter.



Fig. 3. *Chlorophytum comosum*



Fig. 4. *Dipladenia*

Dichondra argentea ("silver plant"), is a herbaceous perennial, characterized by a climbing or creeping habit. On which are frequently found petiolate, round leaves, covered by a small down (fig.5)



Fig. 5. *Dichondra argentea*

Glechoma hederacea is an aromatic and perennial species characterized by a lack of hairs or the presence of a minimal puff, they grow in a creeping manner, the leaves being reniform or cordate-ovate with crenate margins (fig. 6.)



Fig. 6. *Glechoma hederacea*

2. MATERIAL AND METHOD

Starting a business in the field of ornamental plant cultivation consists in setting up a greenhouse with an area of 160 m2 (20 x 8 m) in the village of Lelești, Lelești commune, Gorj county.

Inside the greenhouse there will be 3 rows of cultivation tables of 18 m each, on which 3000 pots will be produced, plus 400 pots with hanging pots. Six plants species will be grown.

The constructions will consist of the actual greenhouse (fig.7) and ancillary spaces (a 3x2 m shed for storing materials and a 3x3 m gazebo as a work space in the warm season).

The works to be performed are:

- mounting the greenhouse (fig. 8)
- execution of pits (fig. 9)
- mounting the foil (fig. 10)
- mounting and fixing the hinged front covers (fig. 11)

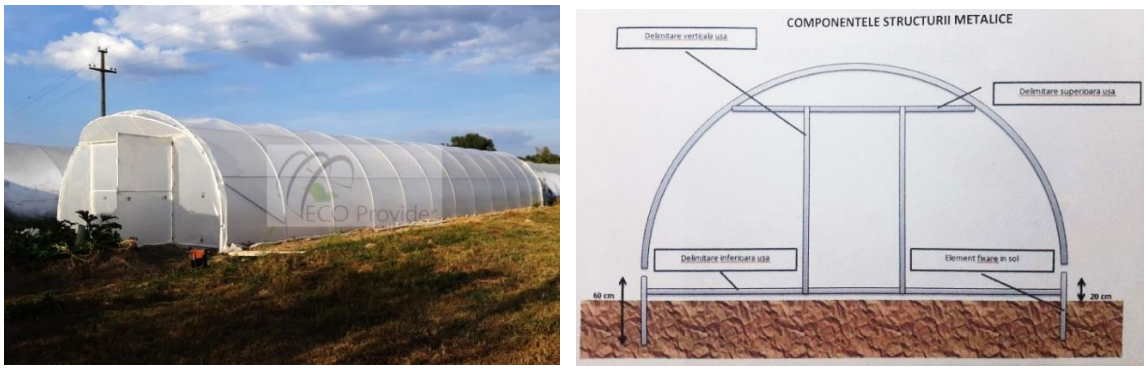


Fig. 7 The structure of the greenhouse



Fig. 8 Assembly of the greenhouse



Fig. 9. Execution of pits



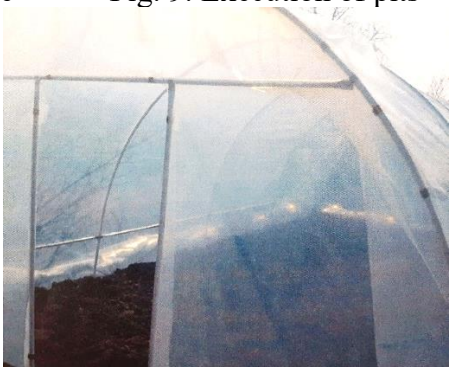
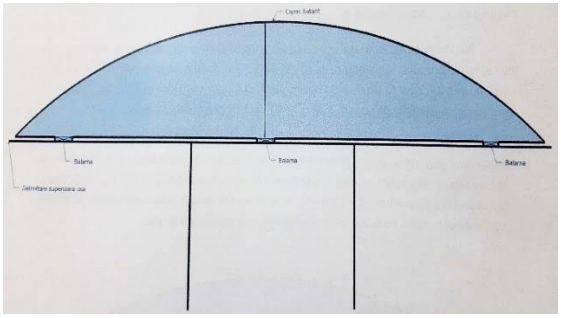


Fig. 10. Mounting the foil



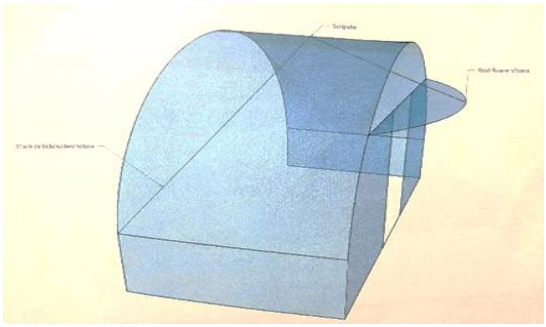


Fig. 11. Mounting and fixing the hinged front covers

Ornamental plant cultivation technology

- **Obtaining cuttings**

The establishment of flower crops in greenhouses is carried out, for most species, using vegetatively propagated biological material: rooted cuttings, plant divisions and stolons.

It will be purchased from suppliers and produced individually starting from the second year of cultivation. (Fig. 12)





Fig. 12 Examples of cuttings

• **Surface preparation and planting**

The greenhouse is equipped with 6 culture tables, each 9 m long and 1.82 m wide. They are arranged in three parallel rows, 2 per length, so that they cover 18 m long.

On the remaining 2 m length, a 1000 L water container, black in color and with UV protection, will be placed in one part of the greenhouse. A passage space of 1.27 m will be left between the three rows of tables. (Fig. 13.)

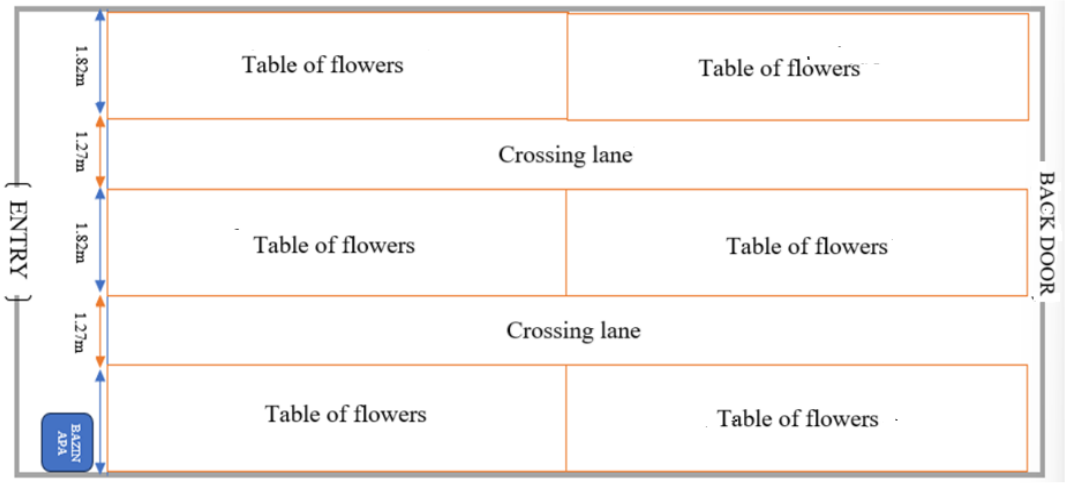


Fig. 13 Interior design of the greenhouse

Fixed tables with floodable trays will be used as culture tables. (Fig. 14)



Fig. 14 Fixed table with flood trays

Pots of maximum 18 cm will be placed on the tables. On a cultivation table 500 pots will be placed, 50 per length and 10 per width. In addition, 50 pots with hangers will be hung on each edge of the length of the cultivation table. In addition, above each table edge there will be four sections of 18 m each to support the hanging pots, with 50 pots on each section.

In total, a number of 3400 plants will be cultivated, of which 400 are pots with hangers.

• **Crop irrigation**

The method by which irrigation will be done is through a drip irrigation system. The 1000 L container will be supplied with water from the street network or from the own well. (fig. 15)

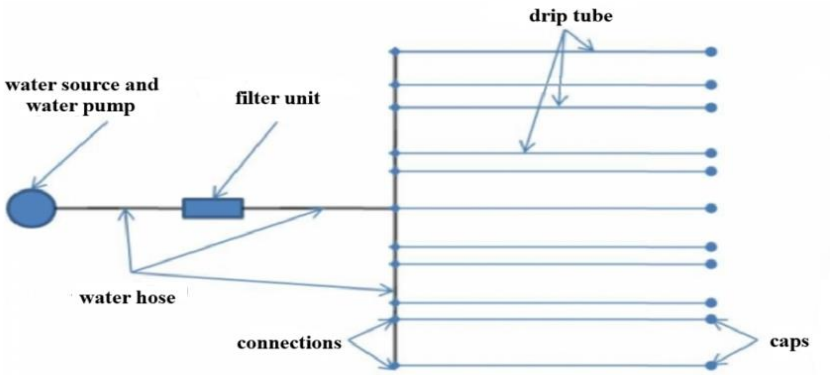


Fig. 15. Drip irrigation system

- **Culture maintenance**

The main crop maintenance works are: parcel treatment, gap filling, facial fertilizing, tutoring, airing, shading, pot changing, transplanting, doubling the greenhouse walls, cleaning, cutting, pinching, budding, trimming, etc.

Fazial fertilizations, both with chemical and organic fertilizers, have the role of providing the plants with the optimal nutrient requirements according to the stage of growth and development. The doses of fertilizers and the frequency of fertilizations are determined according to the species, phenophase, culture system, the purpose of the culture, the level of environmental factors and the type of fertilizer. (Table 1.)

Table 1. Fertigation recipe for ornamental plants

Application period	Requirements in mineral elements			Necessary for the pond of 1000 l (g/l)
	N	P	K	
January - February	11	52	5	1500
March	30	10	10	1500
April - May	10	5	40	1500
The rest of the period	20	20	20	1500

Necessary technological equipment:

• mixer for shredding, sifting and mixing the substrate for pots;

• spraying and spraying devices.

• planting spoons and wooden planters of different thicknesses.

• scissors for trimming plants and scissors for harvesting and castrating flowers.

• two sirocors (portable diesel-based heaters). (fig. 17)



Fig. 17. Portable diesel-powered sirocco

3. RESULTS AND DISCUSSION

To demonstrate the economic efficiency of setting up a greenhouse for the cultivation of ornamental plants, the following are presented:

- **total expenses with equipment and machines:** labor costs (table 2), expenses for the greenhouse and outbuildings (table 3), expenses with the irrigation system (table 4), expenses with other equipment and machines (table 5), total expenses with the investment (table 6.)
- **annual expenses:** expenses with cuttings (table 7), expenses with the substrate (table 8), expenses with pots (table 9), expenses with fertilizers (table 10), expenses with phytosanitary treatment no. 1,2,3 to10 L water (tables 11,12,13)
- **total annual expenses** (table 14).

Table 2. Labor costs

Nr. crt.	Title of the work
1.	Deforestation of the location
2.	Land leveling
3.	Installation of the greenhouse
4.	Concreting
5.	Installation of tables
TOTAL	**3000 RON**

Table 3. Expenses for the greenhouse and outbuildings

The name of the space	Price (lei)
Professional greenhouse 160 m^2	13430
Shed for storage	1864
Pavilion	10710
Concrete	1980
Sand	1000
TOTAL	**28984**

Table 4. Irrigation system expenses

Denumirea	UM	Cantitatea	Preț	Total RON
Container apă 1000 L	buc	1	2880	2880
Pompă submersibilă	buc	1	399	399
Furtun rolă 25 m	buc	1	339	339
Țeavă polietilenă	m	4	2,2	8,8
Cot țeavă	buc	4	8	32
Tub orb picurare 400 m	buc	1	102	102
Tub capilar	buc	3400	0,45	1530
Pix tub capilar	buc	3400	0,26	884
Filtru ¾	buc	1	35	35
Robinet	buc	12	1,5	18
Cot	buc	15	0,44	6,6
Teu	buc	15	0,44	6,6
Dop tub picurare	buc	12	0,44	5,28
Garnituri	buc	20	0,44	8,8
Mufă legătură	buc	12	0,44	5,28
TOTAL				**6260,36**

Table 5. Expenses with other equipment and machinery

Denumirea	UM	Cant.	Preț	Total RON
Masă de cultură	buc	6	2786	16716
Încălzitor sirocou	buc	2	799	1598
Ventilator	buc	2	109	218
Vermorel 16 L	buc	1	237	237
Atomizor	buc	1	89	89
Plasă umbrire 75% 4m l și 100m L	buc	1	1200	1200
Malaxor	buc	1	953	953
Vas pentru prepararea substratului 90 L	buc	2	54,72	109,44
Set unelte	buc	2	124	248
Găleți	buc	5	6,64	33,2
Folie efect termicitate 5,5m l și 100m L	buc	1	646,25	646,25
TOTAL				**22047,89**

Therefore, the total expenditure on equipment and machinery is formed from the sum of expenditure on the irrigation system and the sum of expenditure on other equipment and machinery. The total expenses for equipment and machinery are 28308.25 RON.

Table 6. Total expenses with the investment

Name of expenses	The value (RON)
Labor costs	3000
Expenses for the greenhouse and outbuildings	28984
Total expenditure on equipment and machinery	28308,25
TOTAL	**60292,25**

Table 7. Expenses with cuttings

The name	UM	The quantity	Price	Total RON
Bougainvillea	buc	500	3,5	1750
Dipladenia	buc	500	4,85	2425
Hibiscus rosa-sinensis	buc	500	5,5	2750
Chlorophytum	buc	500	5	2500
Dichondra	buc	500	2,15	1075
Glechoma	buc	500	2,10	1050
TOTAL				**11550**

Table 8. Expenses with the substrate

Product name	UM	The quantity	Price	Total RON
Granulation peat 0-20	buc	3	150	450
Granulation peat 7-20	buc	2	152	304
Granulation peat 10-30	buc	6	155	930
Pearl stone 110 L	buc	2	80	160
Sand	m^3	1	200	200
TOTAL				**2044**

Table 9. Expenses with pots

Product name	UM	The quantity	Price	Total RON
Flower pots 10 cm	buc	3000	0,18	540
Flower pots 14 cm	buc	1000	0,36	360
Flower pots 21 cm	buc	1000	2,1	2100
TOTAL				**3000**

Table 10. Expenses with fertilizers

Product name	UM	The quantity	Price	Total RON
Solfert 11-52-5 1kg	buc	12	20	240
Solfert 30-10-10 1kg	buc	6	15	90
Solfert 10-5-40 1 kg	buc	12	16	192
Solfert 20-20-20 1kg	buc	30	15	450
TOTAL				**972**

Table 11. Expenses with phytosanitary treatment no. nr. 1 to10 L water

Product name	UM	The quantity	Price	Total RON
Mospilan 1,5g	buc	2	4,69	9,38
Nissorun 5g	buc	1	5,12	5,12
Score 2,5ml	buc	2	7,19	7,19
TOTAL				**21,69**

Table 12. Expenses with phytosanitary treatment no. nr. 2 to10 L water

Product name	UM	The quantity	Price	Total RON
Flipper 6ml	buc	1	8,6	8,36
Previcur 10ml	buc	1	9,81	9,81
Topas 3ml	buc	1	5,17	5,17
TOTAL				**23,34**

Table 13. Expenses with phytosanitary treatment no. nr 3 to10 L water

Product name	UM	The quantity	Price	Total RON
Vertimec 10ml	buc	1	14,17	14,17
Mavrik 2ml	buc	1	4,5	4,5
Zeco 100g	buc	1	13,5	13,5
TOTAL				**32,17**

The average treatment cost per 1.5 months is calculated as follows:

$$Cm = \frac{T1+T2+T3}{3}$$

Where:

Cm – the average cost of treatment at 1,5 luni;

T1 – the average cost of treatment nr. 1 = 21,69 RON;

T2 – the average cost of treatment nr. 2 = 23,34 RON;

T3 – the average cost of treatment nr. 3 = 32,17 RON;

$$Cm = \frac{21,69+23,32+32,17}{3} = 25,7 \text{ RON}$$

The average annual cost of phytosanitary treatments represents the average cost per 1.5 months applied 8 times a year and is 205.6 RON.

Heating expenses

The plants are sown on February 1.

Diesel consumption:

- 5 L diesel per day;
- Every 100 days there is a consumption of 500 L diesel;

The cost of diesel at the price of 7.2 RON L is 3600 RON.

Table 14. Total annual expenses

Name of expenses	The value (RON)
Expenses with cuttings	11550
Substrate costs	2044
Pot expenses	3000
Fertilizer expenses	972
Average annual expenses with phytosanitary treatments	205,6
TOTAL	**17771,6**

Substrate preparation:

0.5 RON/L peat;

0.72 RON/L perlite;

0.66 RON/L sand

5L of perlite and 5L of sand are added to 50L of peat.

Cost = 50·0.5 + 5·0.72+5·0.66 = 32 RON

So, 60L of substrate costs 32 RON. So, 1L of substrate costs 0.53 RON.

In contrast, the cost of heating a pot is 1.2 RON, because the total cost of diesel is divided by the total number of plants.

Pre-calculation of the selling price

Pre-calculation of the price of plants in 10cm pots

Expenses:

Average cutting price 5 RON;

Price of 10cm pots 0.18 RON;

0.3L is used per pot. So, the price of the substrate for a pot is 0.17 RON;

Heat cost 1.12 RON.

Total production expenses = 1.2 + 5 + 0.18 + 0.17 + treatments ≅ 6.7 RON

Fixed selling price: 12 RON

Profit margin: 5.3 RON

It is expected to sell 1000 pots until transplanting into larger pots.

Income from the sale of plants in small pots = 1000·12 = 12000 RON

At 90 days, the remaining 2000 pots are transplanted, Bougainvillea and Hibiscus into 14cm pots, and Dipladenia, Chlorophytum, Dichondra and Glechoma into 21cm pots.

They are estimated to sell equally, so 166 of each. So, 334 pots of each variety will be transplanted.

***Bougainvillea* and *Hibiscus* plant price pre-calculation**

Expenses:

Price of a 14cm pot 0.36 RON;

Substrate price 0.37 RON.

Total production expenses = 12 + 0.36 + 0.37 + treatments ≅ **12.73 RON**

Fixed selling price: 20 RON (includes labor, irrigation, electricity, treatments, depreciation)

Precalculation of the price of *Dipladenia, Chlorophytum, Dichondra* and *Glechoma* plants

Expenses:

21cm pot price - 2.1 RON;

Substrate price 1.16 RON.

Total production expenses = 12 + 2.1 + 1.16 + treatments ≅ **15.26 RON**

Set selling price: 25 lei (includes labor, irrigation, electricity, treatments, depreciation)

The flowers are expected to be sold by october.

Income from the sale of plants in 14cm pots = 668·20 = 13360 RON

Income from the sale of plants in 21cm pots = 1336·25= 33400 RON

Income from the sale of plants in 21cm pots =1336·25 = 33400 RON

Total income = 12000 + 13360 + 33400 = 58760 RON

So the profit in the first year is calculated as follows:

First year profit = Annual income - Annual expenses = 58760 - 21371.6 = 37388.4 RON

In conclusion, it is expected that in the second year, the establishment costs of the greenhouse will be amortized.

Diversification and increase in flower production is expected.

4. CONCLUSION

- The establishment of a greenhouse for the cultivation of ornamental plants arose due to the many advantages that greenhouse cultivation offers.
- Starting a business in the field of ornamental plant cultivation consists in setting up a greenhouse with an area of 160 m2 (20 x 8 m) in the village of Lelești, Lelești commune, Gorj county.
- Inside the greenhouse there will be 3 rows of cultivation tables of 18 m each, on which 3000 pots will be produced, plus 400 pots with hanging pots. Six plants species will be grown.
- It is expected that the profit in the first year will be 37388.4 RON and in the second year to amortize the establishment expenses of the greenhouse.

REFERENCES

[1]Anton D., General Floriculture, University Publishing House, Craiova, 2003

[2]Anton D. and Nicu C., Special Floriculture, Craiova University Publishing House, .2007.

[3]Iacomi B.M., Phytopathology, course, Bucharest, 2014.

[4]Milițiu N. and Ailincăi N., Floriculture, Didactic and Pedagogical Publishing House, Bucharest, 1967.

[5]Șelaru E., Apartment plants, Ceres Publishing House, Bucharest, 2006

[6]Șelaru E., Culture of garden flowers, Ceres Publishing House, Bucharest, 2007.

[7]Toma F., Floriculture, course, Bucharest,2014.

https://forestry.com

https://framesmedia.ro/

https://lege5.ro

https://legislatie.just.ro/Public/DetaliiDocumentAfis/47843

https://legislatie.just.ro/Public/DetaliiDocumentAfis/52147

https://www.horticultorul.ro