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ANALYSIS OF THE PRODUCTION OF BULB FLOWERS IN THE REGION OF STARA ZAGORA, BULGARIA

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Abstract

The purpose of the research was to explore the possibilities of growing bulb flowers - tulip, hyacinth, lily and to make an economic evaluation of the production. The research was conducted in the region of Stara Zagora, Bulgaria. The total arable land was 0.1 hectares. The direction of production for tulip and lily was for cut flowers and for hyacinth - for potted plant. As a result of the study was found that among the three cultivated flowers, the highest was the profitability for lily - 77.21%. Lily production was 4.8 times more profitable than tulip production. When growing tulip and lily for cut flowers, net income in the first year was the lowest due to the cost of seedlings. In the following years, the profit increased and the average of net income for one year over three-year growing period was: for lily - 142,850 euro.ha^{-1}; tulip - 5,580 euro.ha^{-1} and for hyacinth 877 euro/1000 pots.

Key words*: bulb flowers, income, Bulgaria.*

INTRODUCTION

Flower farming is a relatively new branch of horticulture in Bulgaria. The favorable soil and climate conditions and Bulgarians' love for flowers result in their cultivation in almost every household and garden.

The industrial production of flowers began in the mid 60's with the building of the first steel-and-glass greenhouses in Velingrad. In 1988, greenhouse flower production accounted for 86.1% of all flower production. In 1970, there were 28.5 hectares of heated steel-and-glass greenhouses. By 1975 that area had grown to 56.8 ha, rising to 96.7 ha in 1978, to 130 ha in 1980, and reaching 148 ha in 1990. An analysis conducted in the field of flower farming shows that between 1970 and 1988, areas planted with flowers kept increasing, and investments generated high return (Denchev and Bachev, 1991). Apart from greenhouses, a large portion of flower types were grown in outdoor areas, which were estimated to cover 144.3 ha of arable land in 2003. Over 7 million units of cut flowers were produced, as well as 2.7 million ornamental flowers and shrubs, and 399,000 pot plants. Flowers were produced in 970 farms, of which 809 were owned by private individuals. The production of cut flowers was comprised of 655 farms, 497 of which were implementing flower production in outdoor areas, while 290 produced greenhouse products. 183 farms specialized in pot plant production. In 2007, there were 500 farms which grew flowers and ornamental shrubs, utilizing a total area of 166 hectares (Ministry of Agriculture and Food, 2008). In comparison with 2003, the production area had shrunk by an negligible margin. The production of pot flowers and ornamental shrubs increased. Implementation of flowers grown in pots saw a rise.

In 2012, flowers and ornamental shrubs were grown in 231 professional farms. The area of the used arable land was 366.8 ha. Cultivation facilities took up 6% of the total area. 61% of farms in 2012 belonged to private individuals. 2,194,800 units of cut flowers and 2,215,100 units of pot flowers were produced in 2012. Of bulb types, 50,200 bulbs were produced, as well as 138 kg baby bulb. Out of the 10,062,200 ornamental flowers and shrubs produced for the decoration of parks and gardens, the highest percentage belongs to ornamental shrubs with 54%, followed by annual flowering species with 37%. 2,061,500 cut flowers were implemented, as well as 1,595,400 pot plants, 7,420,900 ornamental flowers and shrubs. Out of those, 26.1% were for export.

According to statistical data (Ministry of Agriculture and Food, 2016) after 2012 the production and arable land used for flower farming in Bulgaria remained within these values, with no measured growth. A negligible decline in greenhouse production of flowers could be observed, while outdoor areas remained the same, primarily used as seed plots. Sales shrunk by approximately 30% due the insufficient financial capacity of Bulgarians. The reason is, flowers are viewed not as essential goods but rather as a luxury, and that becomes more evident during a unfavorable financial conditions. It is difficult to predict what changes might come in the coming years or long-term, but we hope for positive change.

The purpose of this study was to explore the possibilities for growing basic bulbous flower species by identifying the most important components of the cultivation technology and make an economic assessment of production.

MATERIALS AND METHODS

Methodology of research

The study was conducted in the region of Stara Zagora, Bulgaria on leached cinnamon forest soil. The total area of arable land used was 0.1 hectares, divided into plots with separate flower types as follows:

1. Tulip (genus *Tulipa*) - 0.03 ha;
2. Lily (genus *Lilium*) - 0.04 ha;
3. Hyacinth (*Hyacinthus orientalis* L.) - 1,000 pots.

All of the above-mentioned species are bulb flowers and the bulbs were planted manually. Inter- and intra-row spacing was determined by the size of the bulbs and the aboveground part, as well as the specific requirements of the separate species and types.

In the production of tulips and lilies, the direction taken was for cut flowers, and in the case of hyacinth it was pot plants.

Agricultural techniques for growing flower crops were studied, including tillage, plant protection, fertilization, density of planting, and the planting-to-harvest period. An economic analysis was made for an area of one hectare as the difference between the revenue and the production costs of flowers and production lines. The economic evaluation of production of three types of bulb flowers in a private family business is defined by the difference between the revenue from flower sales and the costs.

The profitability ratio is defined as the ratio of profit to revenue and is expressed in (%).

Types and cultivars of grown bulb flowers were:

- Tulip - 'Darwin' and 'Triumph' (Figures 1, 2);

Figure 1. Tulip cultivar 'Darwin'

Figure 2. Tulip cultiar 'Triumph'
/www.amazon.com/Mixed-Triumph-Tulips/

- Lily - types from Oriental and Asian forms (Figures 3 and 4);
- Hyacinth - 'Anna Marie' and 'Blue Star' (Figure 5).

Agrometeorological conditions of the area

The arable land where the experiment was conducted is located in the climate zone of Central Southern Bulgaria. According to the climatic delineation of the country, this region is part of the European Continental region, and

the Transitional Continental sub-region. In regards to rainfall and air temperature, the region is considered favorable for the cultivation of flowers.

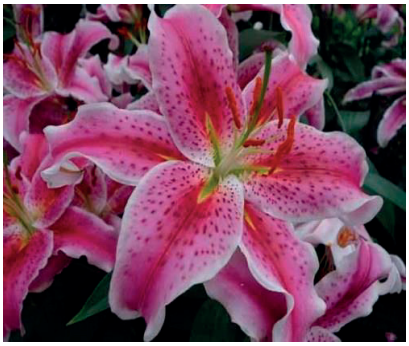

Figure 3. Lily - Oriental form

Figure 4. Lily - Asian form

Figure 5. Hyacinth cultivars 'Blue Star' and 'Anna Marie'

Climate conditions in the region are defined by the cold northern influence, due to the relatively low height of the Stara Planina and Sredna Gora mountain ranges (The Balkan Mountains), and the existence of a southern orographic border, the Rhodope Mountains, which keep southern influences at bay to a degree.

The climate is transitional continental with a Mediterranean influence, and is significantly milder than Northern Bulgaria's climate. Some subtropical characteristics can be observed. Winter is relatively mild with frequent snowfalls, though the snow cover is not persistent. There are 28-31 snow days, starting from the second half of November until the beginning of March. Temperatures reach their lowest in January. Spring begins in the beginning of March. Temperatures rise above 5°C, starting from March 4th-7th. Summer is dry and hot. Average temperature in July is 23.2° C, and 23°C in August. Due to the frequent influx of tropical air masses in July and August, maximum temperatures can exceed 40°C. Autumn is dry, warm and prolonged. The transitional nature of the climate is even more obvious in the annual rainfall distribution. The annual sum of rainfalls is insufficient, at 471 mm (Table 1).

Table 1. Climate characteristics of the region of village Malka Vereya, average for 1978-2018

Month	Average annual air temperature, °C	Monthly sum of rainfall, mm
January	1.2	30.4
February	2.6	27.7
March	6.7	34.9
April	11.8	36.9
May	17.0	54.3
June	21.3	53.2
July	23.7	44.4
August	22.9	41.0
September	18.7	34.0
October	13.3	28.2
November	7.7	42.2
December	3.3	43.9
Annual	12.51	471.1

Two precipitation maximums are observed: one in summer - during May and June; and one in winter - during November and December. The difference between summer and winter rainfalls is small. This equalization is at the expense of winter rainfalls, which increase while summer rainfalls dwindle. The precipitation minimum occurs in August-September. Periods of drought begin earlier, in July, and are lengthier than those in the temperate climate zone. They can last 90-100 days, until the end of October.

Soil characteristics

The soil is of the leached cinnamon forest type. This is a widely spread soil type in Bulgaria. The soil depth profile is 75-120 cm. The soil type is characterized by a well-defined differentiation between the humus and illuvial horizons. The humus horizon has low depth of 25-30 cm, has cinnamon color, and has compacted-to-dense structure. The illuvial horizon is deep (up to 70-80 cm), clayey, compacted, reddish-brown. The carbonates are washed to a depth of 80-100 cm, with the carbonate layer being significantly less pronounced than in typical cinnamon forest soils.

The soil is more clayey than typical cinnamon soils but contains less humus. The total stock of humus in the 1-meter layer varies widely, but 40-45% of it is located in the top 20-30 cm. The content of physical clay is from 58.4 to 60.5%. It contains approximately 2% humus in surface horizon. The soil is poor on nitrogen and phosphorus and rich on potassium.

The physical properties of these soils are not particularly favorable - great connectivity, poor water permeability, swelling when moistened, and if dried they harden and form a solid soil crust. Their natural fertility is poor, but good yields can be obtained with good agricultural technique. These soils are suitable for cultivation of flowering species, field crops, vineyards, tobacco and perennials.

Soil characteristics show low to medium mineral nitrogen storage, low mobile phosphate storage, and medium storage of absorbed potassium. The soil reaction is slightly acidic.

In the case of agricultural production without irrigation, the soil in the area is categorized as good for growing bulb flowers.

RESULTS AND DISCUSSIONS

For tulips, the recommended inter-row distance was approximately 15 cm, and the intra-row distance was 10 cm. The planting depth was 8 cm. The planting scheme for tulip and lily in the field experiment is presented in Table 2.

Table 2. Planting scheme for tulips in Malka Vereya

Flower species	Inter-row spacing cm	Intra-row spacing, cm	Planting depth, cm	Number of bulbs/ 1000 m^2	Number of cultivated bulbs
Tulip	15	10	8	66,500	19,950
Lily	25	15	10	26,700	10,680

The data in Table 3 shows that the highest percentage of production costs was the cost of planting material, which was 96.6% of total costs for tulips and 97.1% for lilies on average for the three-year period. The cost of lily planting material was higher than that of the tulips due to the higher price of lily bulbs (0.46 Euro/unit), compared to tulip bulbs (0.13 Euro/unit). Fuels and pesticides comprised a smaller percentage of the costs. The area was fertilized with manure, potassium sulfate and ammonium nitrate.

Table 3. Costs for the production of cut flower tulips and lilies, Euro/hectare

Period	Bulbs	Fuel	Fertilizer	Pesticides	Total cost
Tulip					
I year	8,500.00	25.50	102.2	7.60	8,635.30
II year	-	25.50	51.10	7.60	84.20
III year	-	25.50	51.10	-	76.60
Average	2,833.30	25.50	68.10	5.10	2,932.00
Lily					
I year	12,286.35	25.50	102.2	10.20	12,424.20
II year	-	25.50	76.70	10.20	112.40
III year	-	25.50	76.70	10.20	112.40
Average	4,095.50	25.50	85.20	10.20	4,216.40

It was vegetatively enriched with leaf fertilizer, once for tulips and twice for lilies. Pesticides were used to treat bulbs and the lilies were sprayed against aphids once in the beginning of vegetation.

The data shows that over the course of one year the production of tulips in a 0.1 ha area cost 2932.00 EUR while lilies cost 1284.4 EUR more, due to the higher price of the planting material.

The cost of the 1,000 units of hyacinth, which were grown in pots, accounted for 41.4%, and as such had the highest percentage, of the total production costs (Figure 6). Electricity costs (22%) were the second most prominent, while pesticides had the smallest percentage.

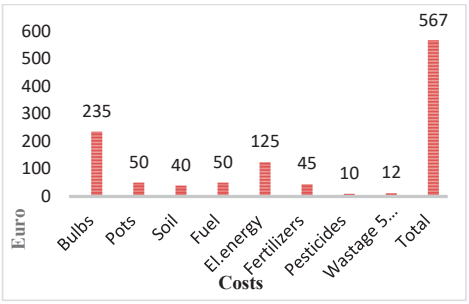

Figure 6. Total production costs of hyacinth, euro

Table 4 depicts the year-by-year and the 3-year-period economic evaluation of production of the three bulb flowers in a private family business in Bulgaria.

It is evident from the (selling price 0.61/unit). For tulips, during the first year of production the net income was negative.

One approach, which reduced losses during the first year, was the distribution of the product at a highe price during periods of high market demand.

In regards to the pot-grown hyacinth with a selling price of 1.53 EUR/unit, the net income was 60% of the revenue, sitting at 877.38 EUR, which places it between lilies and tulips.

Data that revenue from lilies was significantly higher (selling cost 0.77 EUR/unit) compared to those of tulips.

Table 4. Economic evaluation of the production of bulb flowers, euro/hectare

Flower species	For cut flowers		For pot flowers		Net income
	Revenue	Costs	Revenue	Costs	
Tulip					
I year	3,671.10	8,635.7			- 4,964.60
II year	3,488.00	84.40			3,403.60
III year	3,313.20	76.70			3,236.50
Average	3,490.80	2,932.3			558.50
Lily					
I year	19,454.70	12,424.4			7,030.30
II year	18,485.25	112.5			18,372.75
III year	17,562.80	112.5			17,450.30
Average	18,501.00	4,216.50			14,284.50
Hyacinth					
Average	-	-	1,457.20	579.8	877.40

The profitability ratio, which is defined as the ratio of net income to revenue, shows that most profitable was the production of lilies for cut flowers with 77.21%, while the profitability was lower for tulips at 16.00%. Pot production of hyacinth was also characterized by a high profitability with 60.21% (Table 5).

Table 5. Profitability ratio of basic bulb flowers, %

Flower species	Profitability, %
Tulip	16.00
Lily	77.21
Hyacinth	60.21

CONCLUSIONS

Based on the conducted analysis of the growing of bulb flowers - tulip, lily, hyacinth, in the area of the village of Malka Vereya, municipality of Stara Zagora, Bulgaria it can be concluded that over the three-year period lilies had the highest profitability with 77.21%, followed by hyacinth and tulips. The production of lilies was 4.8 times more profitable than that of tulips.

Net income was lowest in the first year of growing tulips and lilies for cut flowers, even dipping in the negative for tulips due to the initial costs of planting material in the first year. During the following years the gross profit increased, reaching a peak in the third year.

The soil and climate characteristics of the region show that conditions are favorable and basic bulb flower types can be produced successfully.

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