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INTEGRATED RISK MANAGEMENT IN A SMALL-DIMENSIONAL LAVENDER PLANTATION IN SOUTHERN ROMANIA

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Abstract

Studying an integrated management of the risks that young entrepreneurs face in trying to establish and maintain a lavender crop has become of real interest, as the competition has become fiercer. The present article focuses on some of the results obtained from our own research, carried out in Cornatelu commune, Dambovita county, in a family holding of 7,500 sqm, in the period 2017-2019. The total area was divided into three equal parts, 2,500 sqm each, the first being classically (control), the second intensively, and the third ecologically managed. During the three years, all the technological stages were followed, making correlations between the applied agrotechnics, the health status of the lavender crop, the yields obtained and the ways of its valorization for each of the tested variants. Results of the research refer both to the risks arising during the vegetation period, as well as to those from the time of harvesting, processing, packaging and delivery of the products for commercialization. The average of the testing period indicated that the classic system brings yield increases of 5-9%, the quality being also superior.

Key words**:** *lavender, management risks, yields, Dambovita County, Romania*

INTRODUCTION

Lavender is one of the few plants that lends itself to crops of different sizes – from very small to large ones, managing to bring material benefits in each case [4, 9, 11, 22]. Even regional tourism is benefited by the existence of these purple cultures, which attract more and more tourists [8], being a new element for Romania.

Authors from all over the world [7, 16, 18, 19, 23] have published works that highlight the fact that, in the case of lavender plantations that were established in compliance with the basic technological parameters (light soil, with low clay content, low rainfall, depth, distance between rows and between plants etc.), no negative values were recorded in terms of the quantity and quality of yields, and the shrubswere productive for over 10 years, the culture being economically efficient [6].

Another benefit of lavender is the fact that it doesn't have significant requirements in terms of fertilizers [14], which in the current input crisis gives it another advantage over other cultivated plants [10]. Pests are also reduced in number, through its characteristics of attracting pollinating insects (bees, butterflies), but repelling mosquitoes, flies, moths [3]. The spectrum of diseases is not extensive [15, 21], which means that they can be quite easily kept under control even in organic farming [12, 17] highly appreciated especially in the case of exploitation of the yield in homeopathic medicine.

In addition, the crop can be used in the medicinal, cosmetic and gastronomic industries [2, 5], being an aromatic plant and being able to be included in many preparations, including desserts [1]. The processing can be done even by the owner of the plantation, who, in this way, can obtain a higher net profit than if he sells the production as a raw material, immediately after harvesting it [24].

Considering all the benefits [13], it was inevitable that a series of risks and challenges in establishing, maintaining and operating a lavender plantation [20] wouldn't also arise, however more in the family system, on a relatively small area.

The purpose of this paper is to analyse the yield data obtained from such a plantation in the south of Romania, maintained and exploited in three different ways – classical

(also named conventional, intensive and ecological, in order to see what are the risks involved in each of the technologies. In parallel, the health status of the shrubs was monitored, which will ensure a longer period of amortization of the initial investment and the durability of the entire plantation.

MATERIALS AND METHODS

In order to obtain conclusive results within the framework of our own research, carried out in Cornatelu commune, in Dambovita County, we started from the pedo-climatic analysis of the land on which lavender was grown, to see if it lends itself to its requirements.

The location of the land is optimal, with a good exposure to the sun. The soil has a neutral pH, with values of 6.7-7.1. The clay content is average, of 20-23%, being able to characterize the upper soil profile as sandy-loamy. Also, benefiting from a slope of about 6%, the water that isn't absorbed by the soil drains on the profile, not ending up pooling on the surface, a beneficial aspect for the roots of the lavender plants, which prefer drought instead of excessive water.

During the research years (2017-2019), the climatic values of temperatures and those of precipitation were monitored with an automatic weather station, located directly in the research field, in order to highlight the importance of these parameters, which can also be included in the risk category for the lavender culture.

The lavender plantation where the research took place was established in the spring of 2013 – the planting took place in the first part of April. In order to adapt to the existing pedo-climatic conditions, seedlings from the *Lavandula angustifolia*species, the Bulgarian variety Sevtopolis, were chosen. The main characteristic of this variety is that a significant amount of essential oil can be extracted from the flowers, which is the second reason why it was chosen. The research started in 2017, that is, in the fourth year from the time of planting, when the culture was approaching full maturity, process that continued until 2019. On the land with a total area of 7,500 sqm, seedlings were planted at a distance of 1m between rows and 50 cm between plants, per row. In total, 15,000 seedlings were planted, their cost being of 12,450 lei, the equivalent of 2,800 euros, to which were added the costs of land preparation, raising the initial investment to 3,500 euros (15,500 lei).

Later, the total area was divided into three plots of equal size, respectively of 2,500 sqm, so that they could be managed differently, using three cultivation systems – classic (conventional), intensive and ecological. Depending on the system chosen, the farming technique was different, which means that the costs involved also varied widely.

To compare the yield results, in each large plot of 2,500 sqm, 6 plots of 10 sqm each were marked, finally monitoring a total of 18 plots x 10 sqm = 180 sqm. In order for the plots to be comparable, given the large distance between the rows, plots of 5 m x 2 m = 10 sqm were delimited, each including 20 plants.

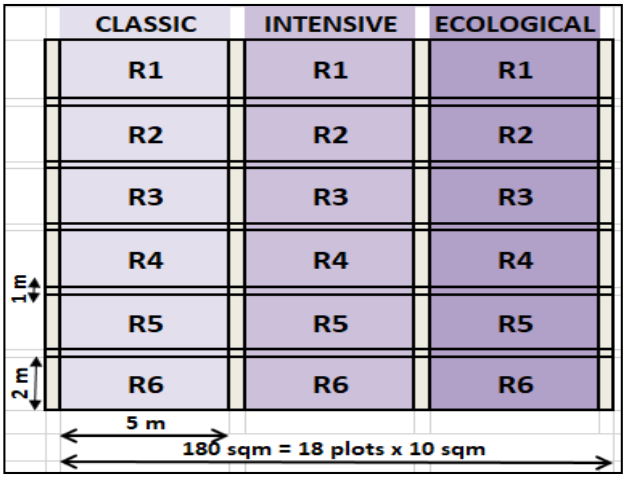

Fig. 1. Technological scheme of the lavender experimental field in Cornatelu, Dambovita County (2017-2019)
Source: Own experiment.

Based on the presented methodology, the technological scheme shown in Figure 1 was created and followed in the study.

In the vegetation, during the three years of research (2017-2019), the following plant parameters were monitored, through measurements made on a number of 10 plants from each plot, based on which the average was made:

-the number of flowers per plant;

-the length of the flower stems(cm);
-number of bunches/inflorescences;
-weight of flowers/plant.

Of the six plots assigned to each of the cropping systems, the yield from three of them was weighed immediately after harvesting and then after being dried, while that the yield from the other three plots was used to obtain the essential oil by cold pressing, to be able to compare the quality of the production.

Harvesting was done manually, as no other option was found for such surfaces. Moreover, one of the constraints of small holdings is precisely related to the manual labour involved in such a plantation, which is difficult to ensure, other by the family members.

Both the data obtained from the vegetation measurements and those obtained after the yield evaluation were combined in tables, so that later they can be processed statistically in Excel.

RESULTS AND DISCUSSIONS

Table 1 shows in details the values recorded for temperature and precipitation during the research period (2017-2019).

Table 1. Temperatures and precipitation recorded in Cornatelu (Dambovita County) during the research period, January 2017 – December 2019

Luna	Temperatures (°C, average)			Precipitations (mm/month)		
	2017	2018	2019	2017	2018	2019
January	-4.1	0.8	0.4	6	0	19
February	1.8	1.5	3.5	16	35	17
March	9.1	4.4	9.9	45	28	26
April	10.8	14.7	11.0	44	8	34
May	16.4	18.8	17.7	29	12	45
June	22.6	21.5	23.4	36	79	38
July	23.7	23.0	24.1	89	66	15
August	24.0	23.8	24.3	21	78	43
September	19.2	21.1	18.8	50	9	10
October	11.6	13.0	13.6	18	10	26
November	6.4	7.3	5.5	64	112	59
December	0.2	4.5	0.8	3	26	38
Mean/Total	11.8	12.9	12.8	421	463	370

Source: own data.

It can be seen that the average annual temperature fluctuates within 1°C, while the precipitation is average in value for Romania, being between 370 and 463 mm/year.

The temperatures didn't have a major influence on the lavender crop, being quite high even in the winter months, but within the limit of the multi-annual average for the southern part of Romania.

On the other hand, the rainfall, which is lower in value and well distributed throughout the year, supported the good development of the plants, which during the three analysed years reached full maturity.

In each of the years, the measurements were made differently (Photo 1), resulting in the comparative figures in Table 2.

Photo 1. The way lavender yield measurements were carried out, depending on the applied crop system (2017-2019, Cornatelu)
Source: Own results.

The values obtained as a result of the measurements were divided into three categories, depending on the agricultural technique applied, but also on the annual costs involved, as follows:

-the classic or conventional system – assumed a system of works as simplified as possible, possibly once at every 2-3 years, only one fertilization with nitrogen per year, depending on the needs, limited phytosanitary treatments;

-the intensive system – it was based on annual soil work, annual weeding, two fertilizations per year, to intensify the production of inflorescences, a treatment with systemic insect-fungicide, to protect the plants;

-the ecological system – as little work as possible, weed removal by manual weeding, fertilization only with manure and composts, natural control of diseases and pests, were appropriate.

Table 2. The parameters monitored for lavender in vegetation during the research in Cornatelu commune, Dambovita County (2017-2019)

Crt.	Crop system / Parameter	Classic/conventional			Intensive			Ecological		
		2017	2018	2019	2017	2018	2019	2017	2018	2019
1.	Number of flowers/plant	540	567	665	549	530	639	512	544	663
2.	Length of the flower stems (cm)	25.8	25.9	26.4	25.7	26.0	26.3	25.6	26.2	26.0
3.	Number of bunches/inflorescences	4.7	5.5	6.8	4.6	5.3	6.1	5.0	5.3	6.5
4.	Weightof flowers/plant (g)	210	235	298	210	216	272	201	237	285

Source: own data.

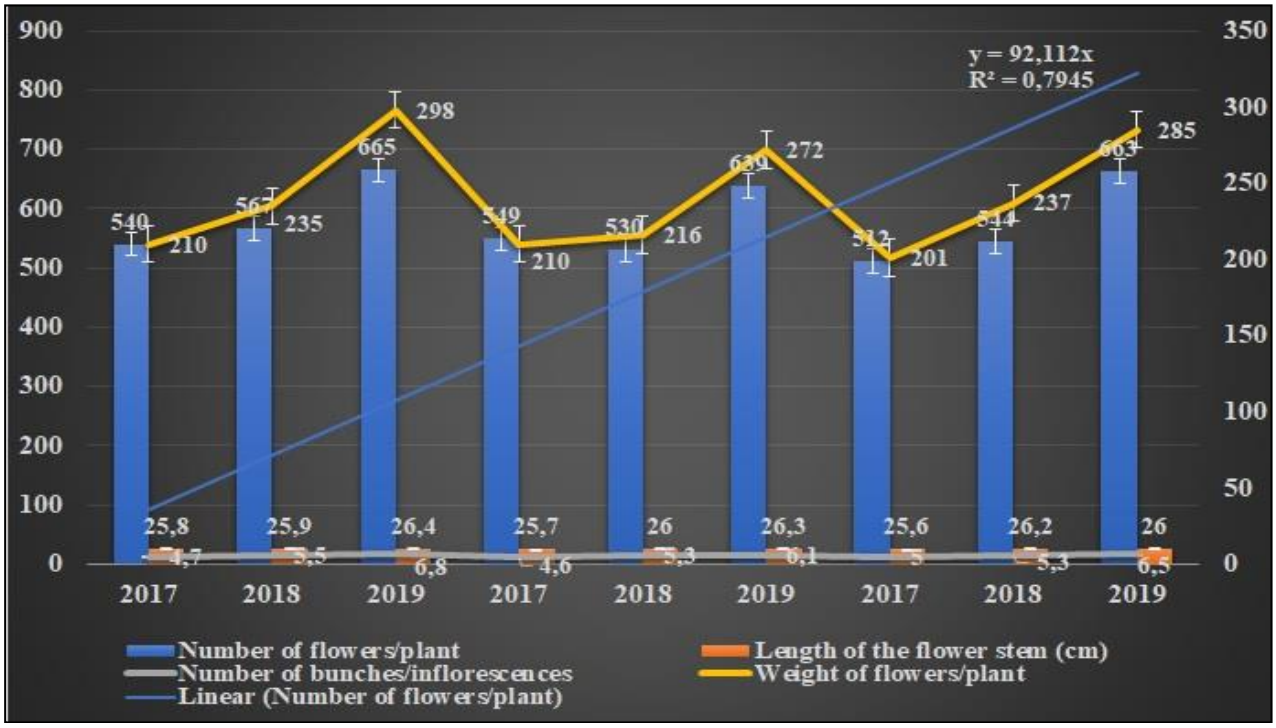

Fig. 2. Graphical representation of lavender production parameters, in the period 2017-2019, together with highlighting the linear growth of the number of flowers/plants, from 2017 to 2019
Source: Own results.

The comparisons were mainly made between the results of the same year, considering that in terms of years, the influence of climatic conditions intervened, but also that of the degree of development of the plants, which were in the aging process, to reach maturity.

A lot of discussions and observations can be made starting from each of the analysed parameters, but on average it can be stated that the hierarchy of lavender's productive elements places the classical system at the top of the ranking, followed by the ecological one, and then by the intensive one, which has higher values mainly reduced in 2019, after in 2017 and 2018 it remained close to the other tested systems. Considering these values, we can say that the culture system chosen is one of the risk factors of lavender production, especially since the additional expenses aren't covered by a higher yield. From managerial point of view, the classic system has the lowest risks and is recommended for a small lavender plantation, such as the one in which the tests took place.

After the time of harvesting, the total yield obtained in each of the plots was evaluated, before drying, in order to determine the yield per hectare. The annual costs involved in obtaining this production were also included in this analysis, in order to establish the level of profit for each of the options. In Table 3, all these calculations are briefly presented, their final purpose being to highlight the differences in terms of the profit brought by each of the tested culture systems. It should be noted that all calculations were made for an area of 1 ha, even if the physical exploitation was only 7,500 sqm.

Contrary to expectations, it is confirmed that the classic system brings the highest profit, one of the explanations being related to the sale price of the production, which wasn't different in the case of organic lavender.

Table 3. The economic situation of the lavender crop from Cornatelu (Dambovita County) during the research period, January 2017 – December 2019

Crt.	Crop system / Economic index	Classic/ conventional			Intensive			Ecological		
		2017	2018	2019	2017	2018	2019	2017	2018	2019
1.	Average yield (kg/ha)	4,200	4,700	5,960	4,200	4,320	5,440	4,020	4,740	5,700
2.	Total expenses (thousandlei/ha)	18.3	24.9	29.3	22.5	29.6	35.0	21.1	26.5	28.4
3.	Selling price (lei/kg)	9	10.8	13	9	10.8	13	9	10.8	13
4.	Income (thousand lei/ha)	37.8	50.8	77.5	37.8	46.7	70.7	36.2	51.2	74.1
	Profit (thousand lei/ha)	19.5	25.9	48.2	15.3	17.1	35.7	15.1	24.7	45.7

Source: own data.

In second place is the ecological system, which in the long term can also bring benefits related to sustainability and environmental protection, as well as better exploitation of production, depending on existing customers. In last place, with expenses unjustified by the level of productions obtained, is the intensive system, which only in the first year (2017) generates a profit similar to that of the ecological variant, so that from 2018 it has significant differences compared to the other two.

CONCLUSIONS

A first conclusion would be that the lavender plantation is a productive and profitable one, even in the case of small areas.

The main risks faced by farmers, especially in the case of the lack of mechanization, are represented by the lack of labour, most of the expenses being those of day labourers hired for various maintenance works, but especially for harvesting.

Another risk factor is the fact that the resulting yield is sold almost entirely immediately after harvesting, since the drying process is laborious and the extraction of the essential oil involves additional costs, quality documents and finding a market. At the same time, as a family business, the annual profit generated by such a plantation cannot ensure full living, and can be considered as an additional activity.

Considering all the presented results, for the average of the testing period (2017-2019) the classic system brought yield increases of 5-9%, which let to a even higher increase in profit, related to the lower costs.

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