

ANALYSIS OF THE MELLIFEROUS AREAS FOR PASTORAL BEEKEEPING – CASE STUDY FOR GIURGIU COUNTY, ROMANIA

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Abstract

In the case of Romania, pastoral beekeeping becomes more and more a system of industrial maintenance of bee families, with economic importance given by beekeeping products that could be obtained, but also with ecological importance given by realisation of the pollination process. The Romanian main areas with importance for pastoral beekeeping are represented by the agricultural crops consisting mainly of sunflower and rapeseed, forests consisting mainly of acacia and lime, and melliferous vegetation from Danube Delta.

The present paper presents an analysis of the main types of honey harvest (rapeseed and sunflower, acacia and lime) from Giurgiu County, in terms of opportunities to practice pastoral beekeeping. We had drawn up the county melliferous balance for the main types of honey harvest on the basis of data regarding honey potential/ha (kg), total surfaces (ha), and total number of bee families from Giurgiu County. Also, we have calculated the percentage of use of the existing honey potential per type of honey harvest by the bee families in the county, and the total number of bee families that could be brought from other counties, through practising pastoral beekeeping.

Our study revealed that Giurgiu County could assure the economic operation of 31,923 bee families, which means about 2.4 times more than the existing number of bee families in the county. By practicing a rational pastoral beekeeping to rapeseed and sunflowers crops, and to acacia and lime forests, on the territory of Giurgiu County could be brought a number of 18,516 bee families, which means the county has an important potential for practicing the pastoral beekeeping.

Key words: *pastoral beekeeping, honey potential, melliferous maps, melliferous crops, melliferous forests.*

INTRODUCTION

Development of beekeeping and increasing the apiculture production (honey, pollen, and other beehive products) are closely related to the richness and diversity of melliferous plants (Ion et al., 2010).

Due to its geographical position, Romania has three large areas of vegetation, namely plain vegetation (36%), hill vegetation (33%) and mountain vegetation (31%), very well balanced in proportion, providing good conditions for development of beekeeping in all areas of the country. The plentiful and varied melliferous flora represented by agricultural crops, forests, and grasslands provide an annual average production of about 20,000 tonnes of honey, out of which polyfloral honey represents about

50%, acacia honey about 35%, and lime honey about 15%.

In order to be sustainable and competitive, the beekeeping has to be “pastoral”, this activity being carried out only by an appropriate planning (Vlad et al., 2012). In the Romanian conditions, the pastoral beekeeping becomes more and more a system of industrial maintenance of bee families, which is aiming not only its economic importance, by beekeeping products which are obtained, but also the ecological importance through the process of pollination.

For supporting and monitoring the activity of the pastoral beekeeping in Romania, within the Ministry of Agriculture and Rural Development there is a National Commission for Pastoral

Beekeeping. Its role is to transfer to beekeepers the possibility to use the excess of the melliferous resources from their county and from other counties, according with Romanian Beekeeping Law no 131/2010. In this way, there is preventing the large agglomerations of hives in some areas, which have as a result healthy risks on bee families, a reduced efficiency for producing honey, and even conflicts between beekeepers. But, an optimal functioning of National Commission for Pastoral Beekeeping requires a good knowledge of the geographical distribution of melliferous areas, surfaces and the potential honey production of these areas, number of bee families present in each county, and number of bee families that could efficiently use the melliferous resources existing in each county.

In the context of those said above, a pilot research project (www.stupas.ro) has been carried out during the period 2008-2011. The main aim of the project was to identify and to evaluate the acacia, lime, sunflower and rapeseed areas, from eight counties, as well as to evaluate the number of bee families, which could be maintained in these areas, from each county. In addition, as one of the final results, the STUPAS project has demonstrated the power and usefulness of the database as a means of storing the apicultural data, this database following to be implemented in a GIS format, which ensures the flow of accessible and useful information to the National Commission for Pastoral Beekeeping, as well as to all beekeepers interested in the spatial distribution of the melliferous forests and agricultural crops.

In this paper, we have presented the results based on data from Giurgiu County, and the perspective of the development of beekeeping on the territory of this county, in direct correlation with melliferous potential of the areas occupied by acacia and lime forests, and by sunflower and rapeseed crops.

MATERIALS AND METHODS

1. Implementation of the data base. For the achievement of this goal, there have been requested three sets of information, namely:

- *Evaluation data of apiaries.* These data include the owner name of the apiary, his address, and the number of bee families in the

apiary. The data have been provided by town halls of Giurgiu County.

- *Evaluation data of forest areas.* These data include information about each forest area in the county, respectively total surface of forests, acacia surface, lime surface, and surface occupied by other species. The data have been provided by the Research and Management Forestry Institute.

- *Evaluation data of agricultural crops.* These data include information about the agricultural areas in each locality, at the level of 2009, respectively the name of the locality, total agricultural surface (ha), out of which sunflower and rapeseed surfaces (ha), other agricultural entomophilic species (ha), as well as the names of the farms. The data have been provided by Agricultural Office of Giurgiu County.

Before including the data said above into the database, each data category received a three-letter code. These codes are used, on the one hand, to the identification of apiaries, forestry areas and agricultural crops, and on the other hand they will allow their use within the GIS system of the melliferous resources.

2. Delimitation of melliferous units with high melliferous opportunities. For achieving this goal, three types of maps have been created, namely:

- Digital maps (in GIS format) with the spatial distribution of acacia and lime forests.
- Digital maps with the spatial distribution of rapeseed and sunflower crops.
- Digital maps of the spatial distribution of the bee families and beekeepers.

Delimitation of these units have been made on the basis of the following criteria: there is at least one forest which can assure at least one main honey harvest; there is a main transportation way and a water source to supply the bee families; there are natural (rivers, lakes, etc.) or artificial (roads, cultivated fields, etc.) limits between the beekeeping units; there are other melliferous sources which can assure the continuity of honey harvest.

3. Establishment of melliferous potential for the main type of honey harvest. The types of honey harvest are specific for each county, from point of view of melliferous potential. For achieving this goal, studies have been performed concerning the relationship between the amount

of sugar/flower and the honey potential for each type of area. Based on the data set, it was established the main types of honey harvest. Scientific establishment of types of honey harvest and their melliferous potential is needed to be established, because it provides various advantages and opportunities for local beekeepers.

4. *Calculation of the percentage use of the existing melliferous resources by the county bee families, and the calculation of the percentage supportability for other bee families that could be brought from other counties, through practising pastoral beekeeping.* We had drawn up the county melliferous balance based on the obtained data at the four melliferous species (respectively the capacity to secrete nectar, in mg/flower, and their total surfaces, in ha) and total number of bee families from Giurgiu County. Taking into consideration three elements (respectively the quantity of honey needed for maintaining the life of the bee family per type of honey harvest; the production of honey planned per bee family and per type of honey harvest; global potential of honey production per type of melliferous area) we have calculated, on the one hand, the percentage use of the existing honey potential per type of honey harvest, by the county bee families, and on the other hand the total number of bee families that could be brought from other counties, through practising pastoral beekeeping.

RESULTS AND DISCUSSIONS

Giurgiu County is located in South Romania, on the left side of Danube River.

Cultivated areas are represented especially by sunflower and rapeseed. In 2009, these crops occupied 49,126 ha, of which 26,725 ha sunflower and 22,401 ha rapeseed.

Forests areas cover an area of over 30,000 ha (Figure 1), among which there are important areas of acacia and lime (Figure 2). Acacia trees cover an area of 4,500 ha, and lime trees cover an area of 3,300 ha.

Due to Danube River, in the South part of the county there is meadow vegetation with high melliferous potential, due to the floristic composition and the amount of nectar/flower, but also due to the favourable flowering period.

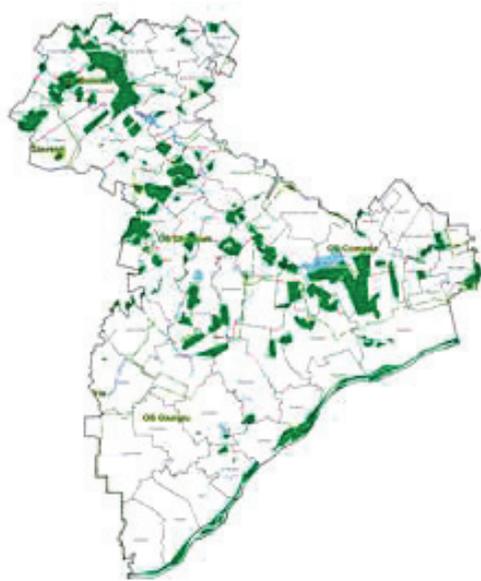


Figure 1. Distribution of forests within Giurgiu County, in 2009

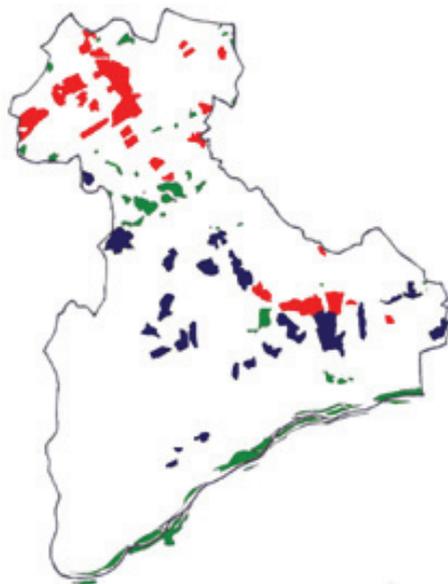


Figure 2. Distribution of forests which have acacia and lime species in their floristic composition within Giurgiu County, 2009

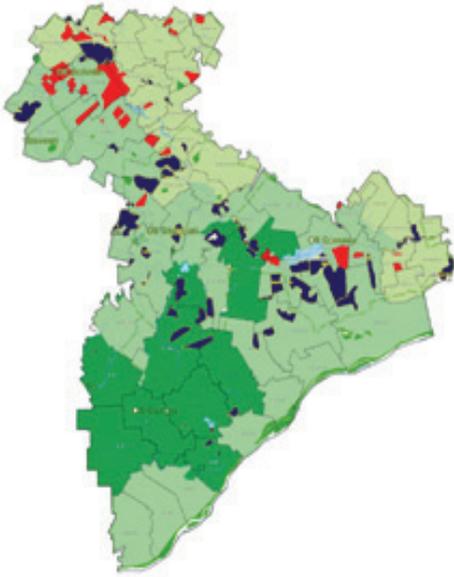


Figure 3. Distribution of areas cultivated with sunflower and rapeseed crops within Giurgiu County, 2009

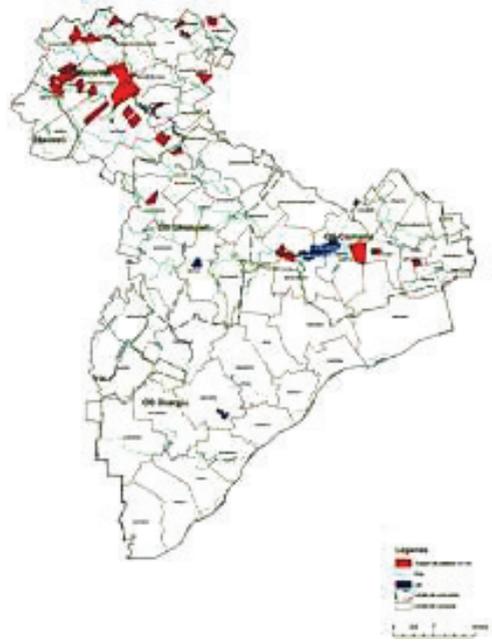


Figure 5. Distribution of lime forests within Giurgiu County, 2009



Figure 4. Distribution of beekeepers and apiaries within Giurgiu County, 2009

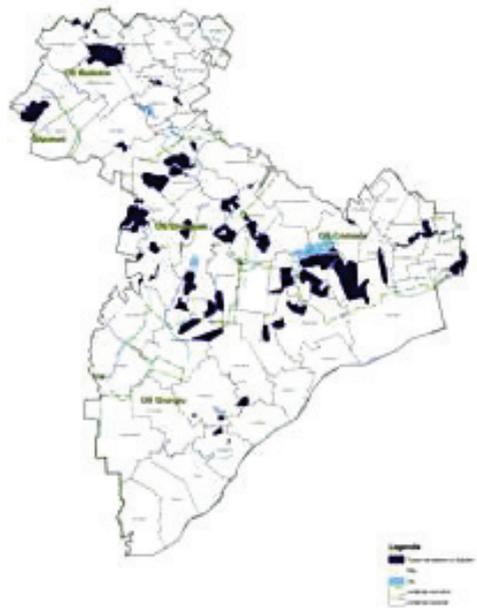


Figure 6. Distribution of acacia forests within Giurgiu County, 2009

Territorial concentration of melliferous areas. In the year 2009, there was a maximum concentration of rapeseed and sunflower crops in South-West part of the county (Figure 3), while the forests which have acacia and lime species in their floristic composition are concentrated in North-East part of the county (Figures 2). In the year 2009, in South-West part of the county, there was cultivated a large area with rapeseed and sunflower crops, respectively 23,452 ha rapeseed and 15,054 ha sunflower, which have represented more than 50% of the total surfaces cultivated within the county.

Number of the local bee families. In the year 2009, there were 13,407 bee families which were managed by 359 beekeepers, out of which 30% had more than 50 bee families and operated over 60% of county population of bee families. Within Giurgiu County, there are no beekeepers practicing industrial beekeeping.

Territorial distribution of beekeepers and apiaries. The beekeepers and apiaries are heterogeneous spread out on the county territory, except two areas, respectively South-East and North-West parts of the county (Figure 4). The majority of areas with high concentration of professional beekeepers are around forest habitats, which proves that beekeeping is an important and sustainable alternative source of income in rural areas, for the benefit of the communities that live in and around forests. From this point of view, beekeeping can be a practical tool for increasing the degree of awareness of these rural communities with respect to the correct and well management and conservation of forests, as well as with respect to increase the forests biodiversity.

Territorial distribution of forest pieces with acacia and lime species in their composition. Lime forests are concentrated in North-East part of the county (Figure 5), while acacia forests are concentrated in the Central part of the county (Figures 6).

Based on the distribution maps of sunflower and rapeseed crops, acacia and lime forests, and bee families, there have been identified two areas of melliferous vegetation:

1. The steppe and silvosteppe area, which includes also the meadow agricultural land. All agricultural land is topped with some lawns and forests across meadow. From an apiculture

point of view, this area is characterised by various honey harvests, respectively:

- two main harvests in the spring, provided by rapeseed crops and acacia forests, which are very intense, but for a short duration, followed by a gap in the melliferous harvest;
- one main harvest in summer, provided by the sunflower crops, with less intensity, but for a longer duration;
- one maintenance harvest in autumn, provided by the vegetation along Danube River, while in the rest of area there is a lack of honey harvest.

2. The hilly area, with vast areas of lawn and forests of beechwood. From an apiculture point of view, this area is characterised by various honey harvests, respectively:

- one maintenance harvest in spring, provided by the rapeseed crops, which are not as important as surface;
- two main harvest in the second half of May and beginning of June, provided by acacia and lime forests;
- one maintenance harvest in summer, provided by sunflower crops and natural lawns.

Due to the vast melliferous areas said above and favourable climatic conditions, Giurgiu County is a very active area, both for the local beekeepers and beekeepers from other counties, in terms of practicing pastoral beekeeping.

On the county territory, there have been delimited four melliferous units with high melliferous opportunities, respectively Bolintin, Ghimpați, Comana, and Giurgiu (Figure 7).

Data processing has shown that, in the year 2009, the four melliferous species analyzed had a potential of 12,450 tons of honey, of which honey bees could collect 4,150 tons of honey, if climatic conditions would have been without any calamities.

Data processing showed us that a number of 31,923 bee families could be economically exploited through the pastoral beekeeping at the crops of rapeseed and sunflower and at the forest of acacia and lime, while there are only 13,407 bee families in the county (Table 1). The difference between the potential number and the existing number of bee families show us that there is an important quantity of honey unexploited.

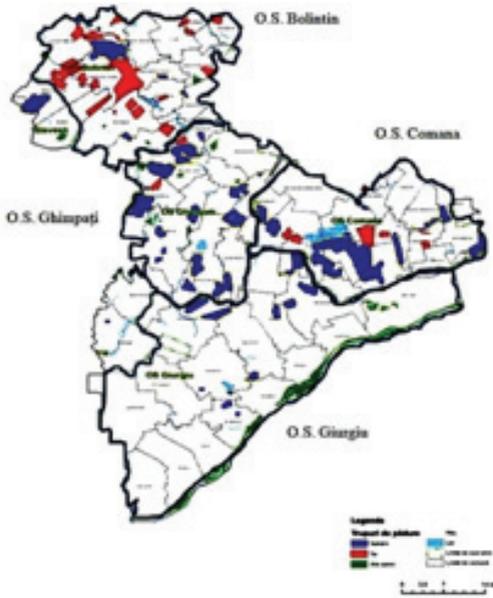


Figure 7. The melliferous units delimited on the territory of Giurgiu County, in 2009

The unexploited honey was recorded at all type of honey harvest analysed, respectively the crops of rapeseed and sunflower and the forests of acacia and lime. However, it should be noted that the surplus of melliferous resources is found out especially at the rapeseed crops and lime forests, which produces almost 58.5%, respectively 21.5% of the total quantity of overall potential production of honey in Giurgiu County. This means that even doubling the current county population of bee families, it would not be possible to valorise completely these sources of nectar (Table 1). As a result, for a more efficient use of the melliferous resources in Giurgiu County, it is recommended that on the one hand, to be increased the number of local bee families and, on the other hand, to be achieved an intensification of pastoral beekeeping from the neighbour counties. In Giurgiu County, the excess of melliferous resources results not only from interpretation of the data, but also from the situation existing in this county. For many years, year after year, many beekeepers from the neighbour counties move their hives to the melliferous forests or crops from Giurgiu County.

Knowing the types of honey harvest and their features (the areas, the honey potential, the

percentage use by county bee families of the existing honey potential per type of honey harvest, the total number of bee families that could be brought from other counties, through practising pastoral beekeeping) from each melliferous units allow the beekeepers to properly establish the method of growth and maintenance of bee families, in accordance with the specific biology of bee families. Also, it creates the premises of a planned work for the preparation of bee families with the aim to obtain a large production of honey and other specific hive products. Moreover, it creates the premises for the improvement of the local melliferous resources, as well as for giving the possibility to organise the pastoral beekeeping on scientific basis.

Table 1. Melliferous balance in Giurgiu County, in 2009

Botanical species	Surface (ha)	Melliferous potential of each resource (kg honey per ha)	Overall potential production of honey (tonnes)	Harvested potential production of honey (tonnes)	Harvested real production at hive* (kg honey per bee family)	Number of bee families which could have economic harvests
Acacia	3,439	335	1,152	384	18	10,666
Lime	4,570	587	2,682	894	11.5	38,878
Rapeseed	22,401	325	7,280	2,427	17	71,375
Sunflower	26,725	50	1,336	445	11	20,246
TOTAL	57,135	-	12,450	4,150	-	31,923

*Data obtained in 2009, in Giurgiu county, South Romania

In terms of ensuring pollination of rapeseed and sunflower crops, the number of local bee families existing in Giurgiu County is unsatisfactory. Data analysis has shown us that there is a deficit of 31,395 bee families for rapeseed crops and 40,043 bee families for sunflower crops. It has to be underline that this deficit is accentuated by the irregular repartition of the bee families at the rapeseed and sunflower crops on the territory of the Giurgiu County. From the analysis of the data regarding the allocation of bee families on the territory of the county, there is a considerable deficit regarding the needs for saturated pollination of the rapeseed and sunflower crops on the territory of some communes. This deficit can be only partially compensated, by the rational distribution of hives on the territories of the communes from Giurgiu County during flowering of agricultural entomophily crops.

CONCLUSIONS

In Giurgiu County there are two main types of honey harvest (rapeseed and sunflower, acacia and lime), with a global potential of 4,140 honey tonnes.

The four main types of honey harvest could assure the economic operation of 31,923 bee families, which means about 2.4 times more than the existing number of the local bee families.

A number up to 18,516 of bee families could be brought within the county by practicing a rational pastoral beekeeping to the main types of honey harvests.

The surplus of honey potential is provided especially by rapeseed crops and lime forests.

There are no beekeepers practicing industrial beekeeping within Giurgiu County; 30% of the total number of beekeepers have more than 50 bee families and operate over 60% of county bee families.

In Giurgiu Country, there is a considerable deficit regarding the pollination of the rapeseed and sunflower crops with the existing number of bee families.

Method developed in the STUPAS project will allow us to study whether melliferous plants existing in an area (cultivated area, forest area,

spontaneous area) at level of village, county, or even in the whole country, provides cost-effective maintenance of the bee families.

For having a correct image regarding the possibilities to increase the number of families of bees and regarding the possibilities for practicing the pastoral beekeeping, it would be absolutely necessary to be carried out studies on the subject on all the counties in the country.

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