

EFFECTS OF THE REGIONAL CONCENTRATION OF BULGARIAN APICULTURE

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Abstract

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Formation and development of the production potential of Bulgarian beekeeping is strongly determined by the peculiarities of natural and climatic conditions, traditions and the production technology. They have a direct impact, on both the density of bee colonies and their production capabilities, and thus define the uneven development of the sector in various regions of the country.

The purpose of this paper is to investigate the effects of regional concentration of Bulgarian apiculture. To achieve this objective the following tasks have to be completed: to analyze the production potential of the Bulgarian apiculture by geographical areas, to assess the spatial location and concentration of the apiaries in the country, and to synthesize the effects of regional concentration. The expectations from the study are that the effects of regional concentration of apiculture in Bulgaria are both positive and negative.

As a result of the analysis some conclusions were drawn:

- the regional concentration of Bulgarian apiculture exerts a positive effect on its production potential
- the processes of concentration of Bulgarian apiculture does not advance homogeneously in all regions of the country
- the northern regions of the country produce 65.38% of the total Bulgarian apicultural products, which forms a strong dependence of the sector on the climatic conditions in these regions and their agriculture. This indirectly may be perceived as a negative effect of the regional concentration of Bulgarian apiculture.

Key words: apiculture; productivity; spatial characteristics; regions; natural honey

Introduction

The production potential of an apicultural system in a given geographical region is determined by the amount of honey produced. It is a natural result of the number of farms, the quantity of bee colonies in these apiaries and their production capabilities. The number of holdings in a given geographical area is associated with the size of its territory, the traditions and the accumulated production experience. The contemporary map of concentration of Bulgarian beekeeping does not differ substantially from what it was half a century ago. Any minor changes are associated solely with the impact of processes of industrialization and urbanization. These

changes are connected primarily to the variation in average number of colonies in an apiary. These values grow in the plains and environmentally clean regions, while in the mountainous parts of the country and close to the industrial areas decreasing trends are observed. This is a result of both the available natural vegetation and agricultural crops grown in the area. They have a direct impact and a positive effect on production capacity of the apiculture colonies.

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centration of apiculture in the country, and to synthesize the effects of regional concentration.

Methodology

The methods used to achieve the goal and solve the tasks are analysis and synthesis, mapping method, axiomatic method, a structural-functional approach, and statistical-mathematical methods.

For the purposes of this study we will analyze the production potential of Bulgarian apiculture at individual region level. Production potential is evaluated initially on the basis of average annual production, which represents the ability of the regions to produce (Lafay, 1992) natural honey and other products.

The second major factor that we will analyze and is involved in formation of the regional production potential is represented by the number of honey producing colonies. In its economic essence, it is the extensive part in the process of formation and development of the production capacity of beekeeping (Otuzbirov et al., 2012). The total number of bee colonies is determined by the number of farms and the average number of hives in one farm:

$$\sum C_i = n_i F_i, \quad (1)$$

where: C_i is the total number of bee families in the i^{th} region, n_i is the number of farms in the i^{th} region, F_i is the average number of colonies per farm in the i^{th} region.

The third major factor of the regional production potential of beekeeping is connected to the evaluation of performance levels of the colonies. It represents the intensive component of change in production (Besedeš and Prusa, 2011), and varies in both time and in space. The variations in this factor are determined in specific years by: the explicit weather conditions and the related to them results of colony's offspring; the number of days suitable for bee flyby and honey collection, as well as the status of vegetation that allows honey collec-

tion. Spatial variation in the levels of performance of bee colonies are determined by natural and climatic conditions of the area in question, the production practices, as well as the related area and intensity of melliferous vegetation (Tuzen et al., 2007).

Indicator for assessing the land usage of individual regions for honey production is the average number of bee colonies per unit of land. The value of this indicator is directly linked to the ability of a given territory to ensure the necessary resources for the development of melliferous vegetation (Makri et al., 2015), allowing for natural honey production:

$$f_i = A_i / \sum C_i, \quad (2)$$

where: f_i is the average number of bee families per 1 square km in the i^{th} region, A_i is the area in the i^{th} region, covered by vegetation supporting honey production (in sq. km.), C_i is the total number of bee families in the i^{th} region.

Regional dimensions of the production potential of Bulgarian apiculture could be assessed most accurately by comparing the relative shares of the available apiaries, the number of colonies farmed in them and volume of honey produced.

Regional Characteristic of the Production Potential of Bulgarian Apiculture

The production potential of Bulgarian apiculture in the six regions of the country is shown in Table 1 conveyed through the annual average production of natural honey for the past ten years. On the basis of its values we formed three groups, in order to organize the six regions of the country. In the first group we placed the areas with highest production potential, which annually produces over two thousand tons of honey, those are the Northeast, North Central and South-eastern regions. In these three regions the areas with the largest shares in honey production are located, such as a Ruse,

Table 1
Production potential of beekeeping regions (tons of honey)

Regions	2006-2008	2009-2011	2012-2014 r.	2015	Average
Northwestern	1563.33	1816.67	1760.5	1981	1713.5
North central	1965.67	2446.67	2598.5	2714	2336.95
Northeastern	2329.67	2224.67	2396	2750	2316.78
Southeastern	1846.33	2125	1703	2548	1891.44
South central	1269.67	898.67	805	890	991.11
Southwestern	597.33	393.67	403.5	505	464.83
Country overall	9572	9905.33	9666.5	11388	9714.61

Source: Own calculations, based on the databases of Agrostatics and the Ministry of Food and Agriculture

Silistra and Dobrich. The second group includes the Northwest region, which has significant production potential, but is characterized by a relatively low level of homogeneity and larger fluctuations in production quantities. This region comprises of areas with high production potential, such as Pleven, as well as some with significantly more modest potential, such as Vidin.

The production potential of the last group, in which the Southwest and South Central region fall is relatively low. The vast majority of areas contained within them, produce under a hundred tons of honey per year. Despite the large area that these two regions reside in, the production of honey in recent years declined. This is due to the natural and climatic conditions, the prevailing mountainous and hill landscape and the lack of large arrangements of melliferous crops. Beekeepers in these areas rely heavily on wild vegetation. An increase in the number of colonies is evident in all regions of the country during the last year of the investigated period, due to the increased level of social support for the sector, as part of the EU's CAP.

Regional Concentration of Bulgarian Beekeeping

The production potential of Bulgarian apiculture is concentrated in farms with different size and production technological level. Their economic objectives, structure and location underline their opportunities for production capacity expansion (Atanassova, 2011). The distribution of beekeeping farms within different areas of the country is represented in Figure 1 by their fraction for 2015.

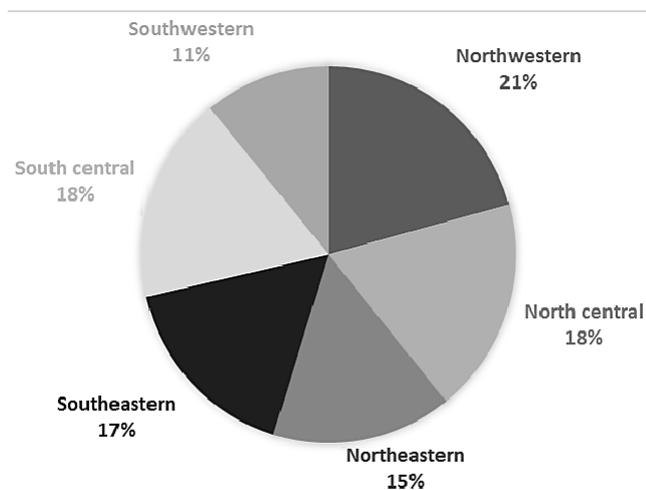


Fig. 1. Distribution of apiaries by regions in 2015

Source: Calculated, based on the Agrostatics database

The information provided by the Department of Agrostatics is consistent with the results of a 2010 comprehensive survey of agricultural holdings in the country. It shows a fairly even distribution of apiaries within the country, which does not correspond to the individual production potential of different areas. This can be explained by differences in size of the beekeeping holdings in various regions, and the average production of a bee colony. Although production capacity of the Northeast region resides in the second group, it is relevant to acknowledge that the Northeast is the leader in number of holdings with over one-fifth (23.03%) of all farms in the country. Right after it, with roughly similar number of apiaries come three areas – North Central with 21.46% Northwest with about two percent less – 19.84% and South-East of 19.39 of those presented in the country. Attention arouses from the data for the last two regions. The Southwest region retains the smallest production potential representing just over five percent (5.13%) of the country's total, while in its territory over 10.89% all apiculture farms are located. Comparing the Northwest and the Northeast region, the second has a less – just 2803 apiaries, or 15.60% of those in the country, but these colonies managed to form the relatively largest regional production potential, that represents 24.15% of the national total. The Southwest region does not have comparative advantages in the production of apiculture products, due to the lack of a significant array of suitable vegetation (Agrostatics, 2105). In this part of the country a fragmentation of the holdings can be noticed (Table 2), which prevents the concentration of production and the cooperation of farmers.

Table 2

Regional dimensions of the Bulgarian beekeeping in 2015

Regions	Average land per one apiary in sq. km.	Bee colonies per one sq. km. (fi)	Average size of one apiary
Northwestern	4.46	8.97	31.7
North central	3.96	6.31	38.4
Northeastern	4.62	6.44	48.7
Southeastern	6.28	7.96	38.5
South central	6.96	3.74	20.6
Southwestern	8.58	2.25	15.6

Source: Own calculations, based on the databases of Agrostatics and the Ministry of Food and Agriculture

The regional distribution of bee colonies is presented in Figure 2, expressed through their absolute number for the past five years. The analysis of the data on regional dimensions of the extensive component of production potential changes provides the basis to formulate several conclusion. The first is linked to the close in size extensive base for

apicultural production in two thirds of the regions. Despite some fluctuations and trends of decline in the total number of colonies in four of the regions – Northwest, North Central, Northeast and Southeast, their number is comparable, and ranges from 114 thousand in the South-East to 136 thousand in the North-East. This is based on the close in size territories of these regions, as well as the natural and climatic conditions in them.

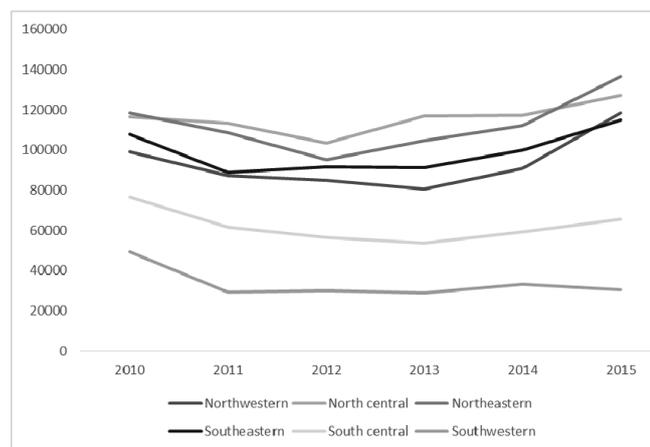


Fig. 2. Number of bee colonies by region for the period 2010-2015

Source: Calculated, based on the Agrostatics database

The observed trend of increase in the number of bee colonies towards the end of the period is more noticeable in the North-West and North-East regions; as a result at the end of the period they slightly outpace respectively the Southeast and North Central regions. This gives us a basis to determine the extensive component of the production potential of the North Central and Northeast areas as most significant and with the greatest positive effect. The shares of these two regions in 2015 represent 44.49% of the country's total. In second place, the Northwest and Southeast regions remain with share in the total extensive capacity estimated at 39.33% of the national. Significantly lower values were perceived in the South Central region-11.05%, and especially in the South-west with just 5.13%, with a clear trend of reduction.

Productivity of the colonies for the six regions of the country is exemplified in Figure 3 through the average annual production from one honey bee hive in 2015, expressed in kilograms. It is impossible to determine the total production due to difficulties with the calculation of the amount of honey used to sustain the colonies.

The weighted average yield of honey from an apicultural family is highest in the Southeast and North Central regions. This positive impact is determined mainly by rela-

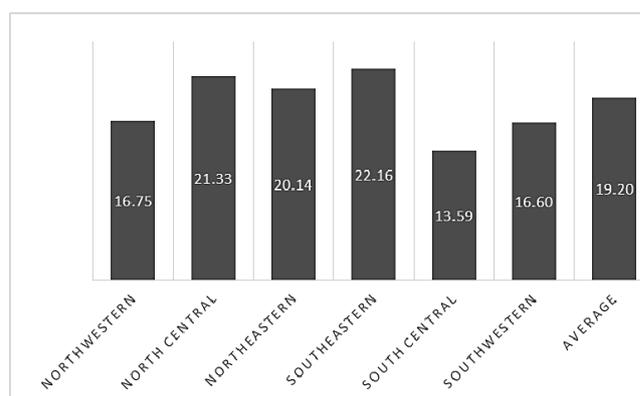


Fig. 3. Regional performance of bee colonies in 2015

Source: Calculated, based on the Agrostatics database

tively intensive and accessible melliferous vegetation such as repeco, sunflower, fennel, fresh cilantro and other agricultural crops. In these areas the mobile apiculture practices are applied at higher rate, which does reduces the distance from the apiary to the vegetation and increases the intensity of the collection of nectar.

The second in performance per apiculture colony are the Northeast and Northwest regions. The disadvantage of the first two areas is negligible and is associated with the different levels of concentration. Significantly lower is the average yield per bee colony in the last two areas – South central and Southwestern. In these regions all four areas in which the production of natural honey per hive is under ten kilograms are located – Kardzhali, Smolyan, Blagoevgrad and Kyustendil. The predominant mountainous terrain and the lack of large arrays of melliferous vegetation are the main factors of importance for these results. It proves to be impossible to compensate this with the larger areas the colonies can take advantage of and the characteristics of wild nectar bearing plants.

Evaluation of the Territorial Location of Apiculture

The territory of Republic of Bulgaria is characterized by great variety. The presence of high mountains and vast plains defines the diversity of melliferous vegetation, as well as the existing agricultural production systems. Landmark features have an immediate effect on the location and concentration of production in different regions of the country. In Table 2 the total area in square km, served by an average of one apiary, the number of colonies, located on one square kilometer on average and the average size of an apiary are presented.

The information presented in the table, allows evaluat-

ing the spatial location of beekeeping in all six regions of the country. The density of apiaries located in different areas is significantly different. In the three regions in Northern Bulgaria it is higher, as the area average utilization of a colony ranges from 3.96 square km in the North Central region, up to 4.62 square km in the North-East. This is determined by the prevailing flat nature of their territory and the areas occupied by concentrated melliferous plants. These natural and economic characteristics allow apiaries to come closer to each other, creating opportunities for concentration and cooperation of the production. However it does have a negative effect on the development of organic beekeeping in these areas. Considerably more area falls in average to one apiary in the three regions in Southern Bulgaria. The values vary from about 6.28 km² in the Southeast, to 8.58 km² in the Southwest areas. The relatively low density of holdings in the Southeast region is determined by the presence of a vast sparsely populated territories (Strandzha-Sakar), as well as environmentally degraded areas in Maritza-East, as well as the circuit in Zmeevo.

The main factors affecting the density in the deployment of the apiaries in the Southwest and South Central region are the dominant mountain terrain and lack of sufficient volume of melliferous crops.

Considering the average number of bee colonies per unit of area we divided the regions in three groups. In the first group fall the North Central and Northeast regions where the density of deployment is nearly two times higher than the national average. Important factors for the density levels are the availability of melliferous crops (rapeseed, sunflower, fennel, coriander) and the relatively larger average size of the holdings. The Northwest and Southeast regions form the next group with a density of the colonies similar to the national average. Determining factor for the state of the

Northwest region is the density of the apiaries, while for the Southeast region it is the average size of the farms. The third group includes the Southwestern and South central regions, where the average number of bee colonies per unit of area is significantly smaller than the country average. This is due to the low density of the colonies and the relatively small size of the holdings. The main determinant of both is the array of melliferous vegetation with prevalence of natural sources, which does not allow for a rise in the concentration.

Out of the five regions of the country with considerable importance for the development of the sector the share of holdings in 2015 is smallest in the North-East region (15.6%). Their larger average size allows them to conquer the first place in number of hives available (23.03%) and to produce over one-fifth (24.15%) of the overall honey in the country. Contradictory are the observed dependencies in the Northwest area in which the largest number of beekeeping farms are situated (20.74%), but they hardly take third place in the relative share of the bee colonies (19.94%) and fourth place on the produced quantity (17.40%) (Figure 4).

The second comparison of interest within the regional analysis of Bulgarian apiculture is between North Central and South Central regions. The number of apiaries in these two areas is commensurate (18.43% vs. 17.72%) with a slight dominance of the first. This difference grew to over ten percent (11.05% vs. 21.46%) when we compared their relative shares in the country's colonies count, which is determined by the larger size of the apiaries in the North Central region. Comparison of the production capacity, based on the amount of produced honey demonstrates a growing advantage of the North Central region that exceeds threefold the production in the South Central region and defines it as the second largest producer.

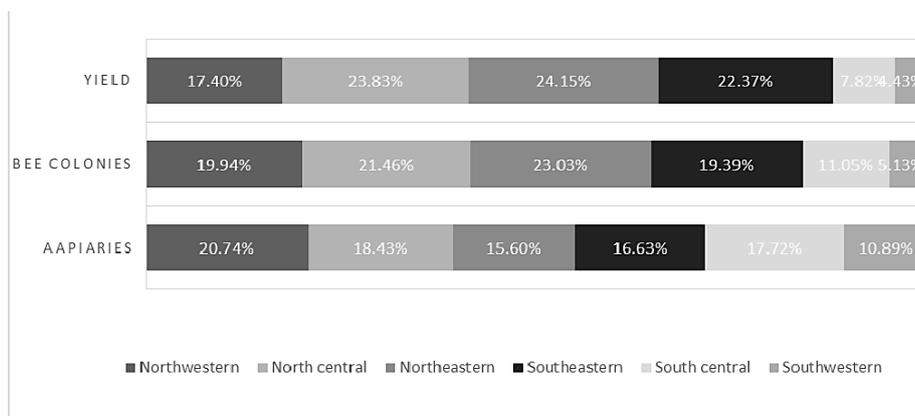


Fig. 4. Comparative regional analysis of Bulgarian apiculture in 2015

Source: Own calculations, based on the databases of Agrostistics and the Ministry of Agriculture

Conclusion

Based on the factorial analysis of the regional concentration of Bulgarian apiculture can be concluded, that it has an overall positive effect on the production potential of the regions. This is mostly influenced by the natural climatic conditions and the presence of large arrays of honey crops.

The relatively even distribution of apiaries and their increased number in the country does not comply with the regional production potential, as there are differences in the size of the farms in the regions and in the honey yield of a bee colony. Positive effect on the growth in the number of holdings and the number of colonies has the increased level of social support for the sector, as part of the EU's CAP. The number of bee hives in a given area and their concentration are key factors in the production of apiculture products, just as much as the array of nectar bearing vegetation and the level of technology applied.

The territorial peculiarities in regions affect directly, both positive and negative, the concentration of apiculture farms and their size.

The processes of concentration of Bulgarian apiculture do not run homogeneously through the various regions of the country. The growing role of North Central, Northwest and Southeast regions are beginning to challenge the role of the North-Eastern, as a leader in the production of honey. Higher productivity and the introduction of new farms using improved technologies and replicating practices from neighboring Balkan countries (Serbia, Greece, etc.) marks the progress of the sector and demonstrates the advantages over traditional technologies used in some regions of the country.

Almost half of the production from the sector (47.98%) is generated in two of the six regions, located in the northern part of the country, where 65.38% of Bulgaria's natural honey is produced. This underlines the strong dependence of the sector on climatic conditions in the northern regions and the crops farmed in them, which is an indirect negative effect of the regional concentration. The management of this dependence and lowering the risks that accompanies it is possible based on the growth of bio production in other regions.

References

- Agrostatisticis**, 2015. *Ministry of Agriculture and Food*, Bulgaria
- Atanassova, T.**, 2011. Enterprising management in the agrarian sector of Bulgaria. *Macedonian Journal of Animal Science*, **1** (2): 401-406.
- Besedeš, T. and T. J. Prusa**, 2011. The role of extensive and intensive margins and export growth. *Journal of Development Economics*, 96.2: 371-379.
- Eurostat**, 2011. Large Farms in Europe, prepared by C. Martins and G. Tosstorff, 18/2011.
- FAO**, 2011. The State of Agricultural Commodity Markets, Rome, Italy.
- Kaneva, Kr.**, 2016. Efficiency and productivity of Bulgarian farms. *Bulgarian Journal of Agricultural Science*, **22** (2): 176-181.
- Kostadinova, N. and I. Nencheva**, 2009. Condition and tendencies in market orientation and competitiveness of Bulgarian stock-breeding. Collection of papers, International Practical-science Conference "Agricultural Sector in Crisis Conditions, 5-7 November, Svishtov
- Lafay, G.**, 1992. The measurement of revealed comparative advantages, In: M. G. Dagenais and P. A. Plunet (Eds.) International Trade Modelling, *Chapman & Hall*, London, pp. 209-236.
- Makri, P., P. Papanagiotou and E. Papanagiotou**, 2015. Efficiency and economic analysis of Greek beekeeping farms. *Bulgarian Journal of Agricultural Science*, **21** (3): 479-484.
- Minondo, A.**, 2007. The disappearance of the border barrier in some European Union countries' bilateral trade. *Applied Economics*, 39: 119-124.
- Otuzbirov, R., R. Kalev and Zh. Gergovska**, 2012. Production efficiency of three fattening systems for Black-and-white male calves, *Agricultural Science and Technology*, **4** (4): 406-410.
- Popova, Z., M. Ivanova, L. Pereira, V. Alexandrov, M. Kercheva, K. Doneva, D. Martins**, 2015. Droughts and climate change in Bulgaria: assessing maize crop risk and irrigation requirements in relation to soil and climate region. *Bulgarian Journal of Agricultural Science*, **21** (1): 35-53.
- Nemecek, T., O. Huguenin-Elie, D. Dubois, G. Gaillard, B. Schaller and A. Chervet**, 2011. Life cycle assessment of Swiss farming systems: II. Extensive and intensive production. *Agricultural Systems*, **104** (3): 233-245, ISSN 0308-521X.
- Tuzen, M., S. Silici, D. Mendil and M. Soylak**, 2007. Trace element levels in honeys from different regions of Turkey, *Food Chemistry*, **103** (2): 325-330.

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