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DETERMINING THE LOCATION OF THE ASSEMBLY CENTER FOR EXTRUSION THE WASTE FROM ROSE PRODUCTION IN REPUBLIC OF BULGARIA

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Abstract

In 3 areas of southern Bulgaria are grown over 2800 ha of roses. Waste of this production is about 20,000 tons. To use this waste is necessary to determining location of the processing factory. To solve this complex task is using a method to measure short distance as a limitation on the maximum distance during transport.

Key words*: remnants of roses, optimization transport.*

INTRODUCTION

In our country and around the world using residues from agricultural production (straw, corn stalks, etc.) (Mitkov, 2014) for extraction of fuel and energy for home and industrial use.
In our country rose oil is know from long time. Production of rose oil is important to livelihood of people living in these areas for the production of roses. These regions are called by the people "Valley of Roses".
For the production of rose oil in Republic of Bulgaria used 2800 ha, as the trend is increasing and in the near future about 4000 ha. The culture is grown in poor soils and specific climatic conditions. By plants using only flowers for making oil. Branches from contour pruning are not used. The stems and branches of roses are having great energy and biological potential. This is not researched to this moment.
Undefined are mass of roses stems, received per unit of area after pruning and the possibility for their collection and their use in heating systems.

MATERIALS AND METHODS

The aim of this study was the determination of the areas, suitable for installation of waste biomass. The areas are with the potential to build a manufacturing plant. In the plant through the press is makes solid fuel from plant biomass remaining fragmented (the roses) in the form of wood chips. For making of information made visits the Regional Directorates "Agriculture" in regional cities in Bulgaria (RD “Agriculture”, 2015).
Information about distances in kilometres between the communities in these Bulgarian areas are receive from web (http://www.bgmaps.com/ and http://www.viamichelin.com/) through the short distance criterion (Komitov, 2013).
The information submitted from Regional Directorates "Agriculture" and electrons sites by municipalities was introduced in a specialized database and processed mathematically.

RESULTS AND DISCUSSIONS

The obtained results of are presented in the below tables and graphics.
In Table 1 are not marked the municipalities without grown or areas occupied with small fields of roses. They do not represent interest for construction of facilities for processing of residues from the manufacture of rose. Those territories are economically disadvantageous. Transport of biomass for other municipalities is connected with additional costs for transport. From table 2 we can see that the rose oil grown in three Bulgarian areas. Two in the South Central Region - Plovdiv and Pazardzhik and one in the eastern region of South- Stara

Zagora. The municipalities with most roses plants are Pavel Banya with 3827 t (19.14%), Kazanlak 3200 t (16.00%), Strelcha 2954 t (14.77%) and Karlovo 2204 t (11.02%). Other municipalities are much less than 10%, with exception of Kaloianovo 1861 t (9.30%) and Brezovo 1519 t (7.59%).

Table 1. Distances in kilometers between different municipalities, km

Municipality	Belovo	Bratsigovo	Pazardjik	Panagyurishte	Peshtera	Strelcha	Asenovgrad	Brezovo	Kaloianovo	Karlovo	Plovdiv	Sopot	Saedinenie	Hisar	Br. Daskalovi	Gurkovo	Kazanlak	Maglizh	Nikolaevo	Pavel Banya	Stara Zagora	Chirpan
Belovo	0	47	27	66	44	73	84	107	83	123	64	127	55	108	130	210	174	189	208	150	158	123
Bratsigovo		0	23	67	7	67	59	82	64	98	44	102	44	83	105	184	149	164	183	125	132	97
Pazardjik			0	44	20	44	57	80	56	96	37	100	25	81	103	183	147	160	181	123	131	96
Panagyurishte				0	63	14	99	101	57	81	76	86	57	57	116	172	135	147	169	119	157	119
Peshtera					0	65	61	84	67	100	46	104	44	85	107	187	152	164	185	127	135	100
Strelcha						0	92	89	45	76	64	72	45	45	104	160	123	135	157	107	142	107
Asenovgrad							0	59	57	90	22	94	48	75	56	136	126	117	135	104	84	46
Brezovo								0	36	54	38	59	54	44	15	104	67	80	101	43	68	31
Kaloianovo									0	41	25	45	32	18	51	132	94	107	129	77	103	68
Karlovo										0	59	5	69	24	70	93	56	69	90	41	89	101
Plovdiv											0	63	25	44	56	141	104	117	138	84	92	51
Sopot												0	73	28	74	98	61	74	95	46	94	105
Saedinenie													0	59	73	156	119	132	153	101	109	74
Hisar														0	59	106	69	81	103	53	102	77
Br. Daskalovi															0	87	70	68	85	46	52	16
Gurkovo																0	39	26	5	62	44	93
Kazanlak																	0	13	35	22	33	82
Maglizh																		0	22	35	25	74
Nikolaevo																			0	61	41	90
Pavel Banya																				0	51	62
St. Zagora																					0	40
Chirpan																						0

Table 2. Total distance in kilometers between municipalities and indicator t*km

	Areas with damask rose, [ha]	Total distance of all points of the municipality [km]	Average value to the distance [km]	Quantity on areas in % for municipality, relative to the total for the country [%]	Quantity waste plant biomass [t]	Parameter t*km for each municipality [t*km]
Belovo	27	2350	106.8	0.982	196.449	2524264
Bratsigovo	50	1926	87.5	1.819	363.795	2102873
Pazardjik	6.3	1814	82.5	0.229	45.838	1990511
Panagyurishte	32	2002	91.0	1.164	232.829	1864303
Peshtera	9.3	1947	88.5	0.338	67.666	2135178
Strelcha	406	1826	83.0	14.770	2954.016	1646880
Asenovgrad	0.4	1701	77.3	0.015	2.910	1862844
Brezovo	208.7	1396	63.5	7.592	1518.481	1131271
Kaloianovo	255.7	1387	63.0	9.302	1860.448	1219379
Karlovo	302.9	1525	69.3	11.019	2203.871	1046270
Plovdiv	0.2	1390	63.2	0.007	1.455	1440378
Sopot	31.3	1605	73.0	1.139	227.736	1113531
Saedinenie	3.1	1547	70.3	0.113	22.555	1603846
Hisar	81.7	1401	63.7	2.972	594.441	1028759
Bratia Daskalovi	93.7	1543	70.1	3.409	681.752	1273304
Gurkovo	81.5	2418	109.9	2.965	592.986	1808460
Kazanlak	439.8	1870	85.0	16.000	3199.942	1153675
Maglizh	58	1999	90.9	2.110	422.002	1352467
Nikolaevo	31.4	2366	107.5	1.142	228.463	1758504
Pavel Banya	526	1639	74.5	19.136	3827.125	982724
Stara Zagora	98.5	1882	85.5	3.583	716.676	1509912
Chirpan	5.3	1652	75.1	0.193	38.562	1528330
Total	2748.8 ha			100 %	20000 t	

The above tables are very well visualized in following Figures 1 and 2.

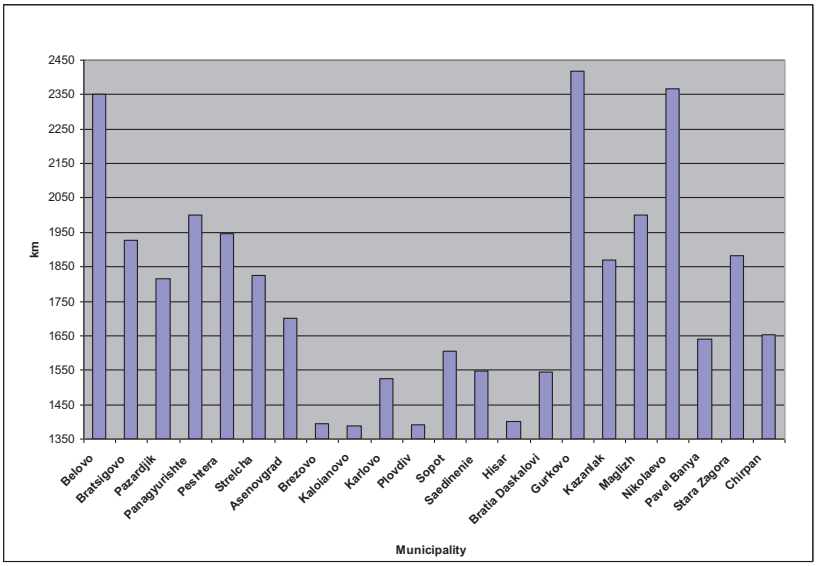

Figure 1. Distribution of the overall distances in kilometers to each municipality, km

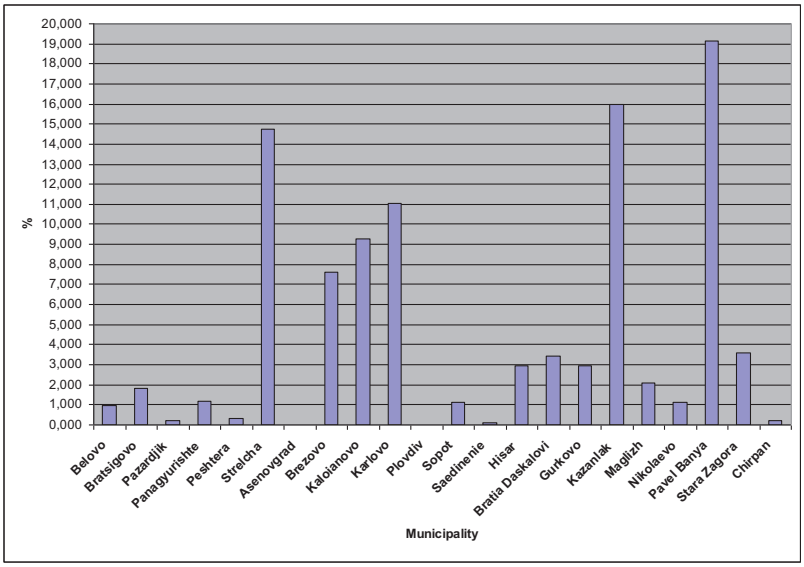

Figure 2. Distribution of areas with oilseed roses by municipalities in Bulgaria, %

To reduce transport costs, which represent the biggest item in the formation of the value of the finished product is a municipality in which the selected indicator [t*km] is the least value. This municipality is Pavel Banya.

Another condition for the selection of the location of the assembly center for the use of residual biomass from the production of roses is farthest municipality is no more than 80 km from it.

Table 1 show that the municipality with the largest share (19.14% or 3827t) is Pavel Banya from all municipalities in the region of Pazardzhik and two municipalities in the area of Plovdiv (Plovdiv and Asenovgrad) are separated by more than 100 km.

Having regard to the above conditions, the geographical location of municipalities, road infrastructure, the possibility of combining freight, freight movements in the country and the possibility of power generation capacity for use with an alternative type of plant biomass is good to give not one but two collection center.

After the mathematical tiling in table 1 and 2 found that these two collection centres are Pavel Banya and Strelcha displayed in figures 3 and 4, as well as the data referred to in table 3 and 4.

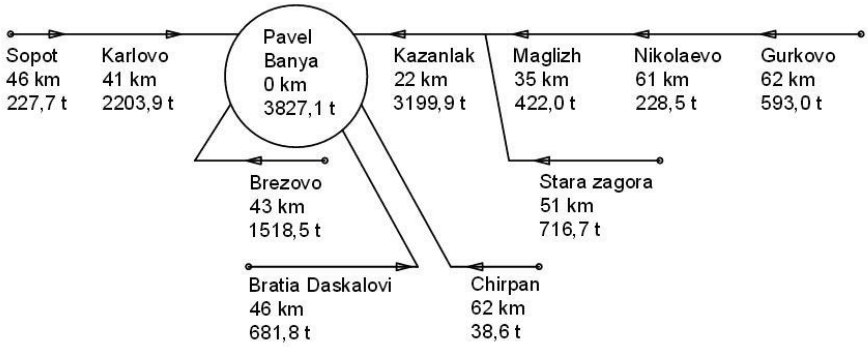

Figure 3. Collecting center Pavel Banya - kilometers and tons

Table 3. Comparsing the performance of Pavel Banya, Kazanlak and Brezovo

	Percentage of total [%]	Quantity waste plant biomass [t]	Pavel Banya [km]	Kazanlak [km]	Brezovo [km]	Pavel Banya [t*km]	Kazanlak [t*km]	Brezovo [t*km]
Brezovo	7.592	1518.481	43	67	0	65294.67	101738.21	0
Karlovo	11.019	2203.871	41	56	54	90358.70	123416.76	119009
Sopot	1.139	227.736	46	61	59	10475.84	13891.88	13436
Br.Daskalovi	3.409	681.752	46	70	15	31360.59	47722.64	10226
Gurkovo	2.965	592.986	62	39	104	36765.13	23126.46	61671
Kazanlak	16.000	3199.942	22	0	67	70398.72	0	214396
Maglizh	2.110	422.002	35	13	80	14770.08	5486.03	33760
nikolaevo	1.142	228.463	61	35	101	13936.26	7996.22	23075
Pavel Banya	19.136	3827.125	0	22	43	0.00	84196.74	164566
St.Zagora	3.583	716.676	51	33	68	36550.49	23650.32	48734
Chirpan	0.193	38.562	62	82	31	2390.86	3162.11	1195
Total	68.29%	13657.596	469	478	622	372301	434387	690069

Pavel Banya municipality is located near the junction of main roads in the national numbering №6 (E871 - European numbering) also called "sub-Balkan highway" road №56, which together with the nearest road connecting the District Plovdiv №64 pass Shipka, north and central regions of Bulgaria and the Danube bridge checkpoint at Rousse.

The road №6 are arrays of the municipalities Sopot, Karlovo, Kazanlak, Nikolaevo and Gourkovo.

Near the road №56 is located in the municipalities of Plovdiv, Brezovo and Br. Daskalovi.

Near to Kazanlak municipality are crossing roads №6 (E851) and №5 (E85).

Route №5 (E85) passes on the territory of the municipality of Stara Zagora and the pass of the Republic (Haynbuaz), as part of crossborder North-South (Danube Bridge limit and Kapitan Andreevo border checkpoint).

In Pavel Banya municipality has a well developed road network of second and third class between the settlements.

In figure 3 you can see that this distribution in the most remote municipalities in the collection center is at a distance of 65 km. From Pavel Banya municipality is collecting 68.29% (13658t) from residual biomass rose production in Bulgaria.

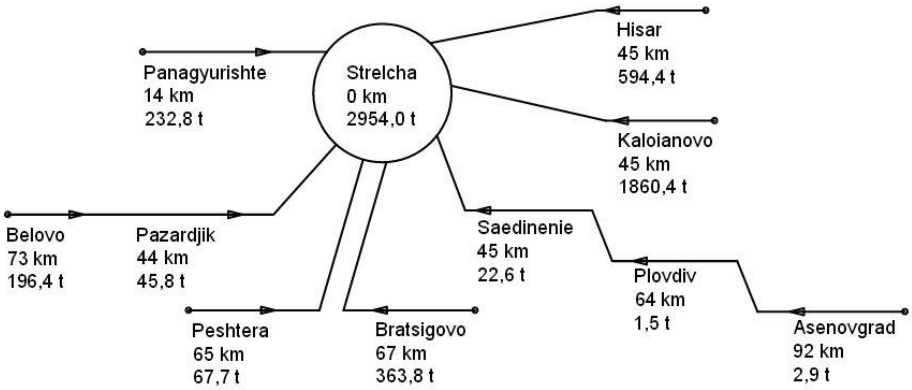

Figure 4. Collecting center Strelcha - kilometers and tons

Table 4. Comparsing the performance of Strelcha, Kaloianivo and Hisar

	Percentage of total [%]	Quantity waste plant biomass [t]	Strelcha [km]	Kaloianovo [km]	Hisar [km]	Strelcha [t*km]	Kaloianovo [t*km]	Hisar [t*km]
Belovo	0.982	196.449	73	83	108	14340.80	16305.30	21216.5
Bratsigovo	1.819	363.795	67	64	83	24374.27	23282.89	30195.0
Pazardjik	0.229	45.838	44	56	81	2016.88	2566.94	3712.9
Panagyurishte	1.164	232.829	14	57	57	3259.60	13271.25	13271.2
Peshtera	0.338	67.666	65	67	85	4398.28	4533.61	5751.6
Strelcha	14.770	2954.016	0	45	45	0	132930.73	132930.7
Asenovgrad	0.015	2.910	92	57	75	267.75	165.89	218.3
Kaloianovo	9.302	1860.448	45	0	18	83720.17	0	33488.1
Plovdiv	0.007	1.455	64	25	44	93.13	36.38	64.0
Saedinenie	0.113	22.555	45	32	59	1014.99	721.77	1330.8
Hisar	2.972	594.441	45	18	0	26749.85	10699.94	0
Total	31.71%	6342.404	554	504	655	160236	204515	242179

Strelcha municipality is situated in Pazardzhik. It has the highest percentage of residual biomass from the production of roses in comparison with the other municipalities in the area.

This includes municipalities of Hisar, Kaloianovo, Saedinenie, Plovdiv and Asenovgrad in Plovdiv region. They are located near to Strelcha, than to Pavel Banya. The Hissar and Kaloyanovo are near the main road №56 (in Plovdiv Karlovo Pavel Banya). They have a border with the municipality of Strelcha. In Kaloyanovo is 9.30% (1860t) of total waste, but the indicator [t * km] is a bigger in value than Strelcha.

This sheme except Asenovgrad (92 km), the other points are located less than 80 km from an assembly center there.

The reasons for inclusion of Asenovgrad in this group are remoteness from Pavel Banya (104 km), paltry quantity of biomass 0.015% (2.91t) and the ability to be combined with the compound from Plovdiv.

The above good preview on next figures 5 and 6.

On Figure 5 are presented middle arithmetic values to a collection center. Here there is a big difference between the variants with one or with two collection centers.

In the scheme with two centers Strelcha plus Pavel Banya the middle arithmetic value of kilometers larger than scheme Kaloianovo plus Kazanlak. The next Figure 6 shows that the parameter t*km in the first scheme is less than the second. Where the parameter t*km is with smaller values, and then the transport costs are lower. It follows that the scheme Strelcha plus Pavel Banya is better, despite a bigger average distance.

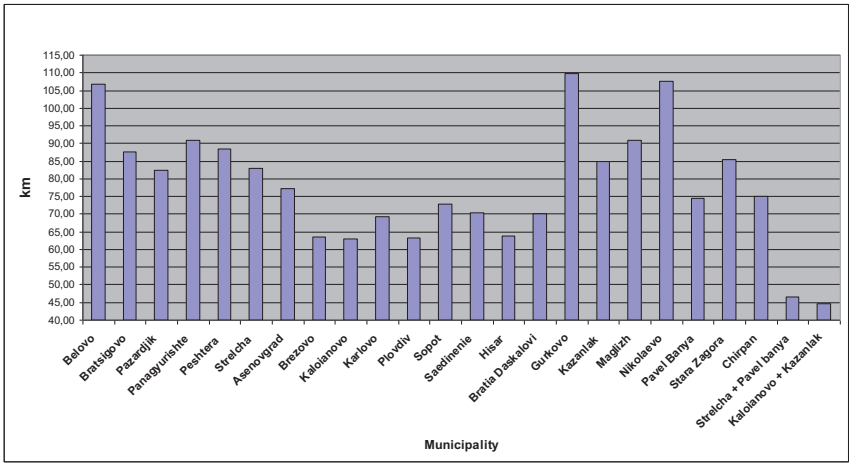

Figure 5. Arithmetic average to a collection center, km

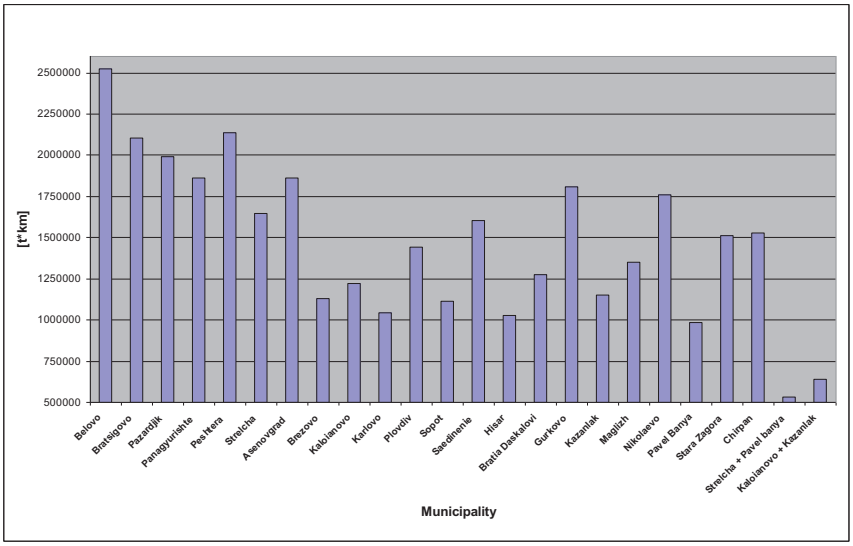

Figure 6. Parameter t*km of assembly centers, t*km

CONCLUSIONS

On the basis of the above, can be formulating the following conclusions:

1. Judging by the location of cultivated areas, the amounts of biomass and distribution by municipalities is best to develop two collection centres for the processing of residual biomass from the production of roses;
2. Municipalities in which can be established centres for the processing of residual biomass of sticks from roses are Pavel Banya municipality and the municipality of Strelcha.

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