AGRI-ECOLOGICAL ZONING OF MUNICIPALITIES IN THE KYUSTENDIL REGION

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Abstract

It has been done agroecological zoning of nine municipalities in Kyustendil area - Bobovdol, Boboshevo, Kocherinovo, Kyustendil, Nevestino, Rila, Sapareva bania, Dupnitza and Treklyano. Agro-ecological zoning is done based on certain environmental characteristics, basic of which are: prevailing soil type; an extreme manifestation of certain climatic factors; altitude; relief features and other. In the presented paper were analyzed and described: weather conditions; soil resources; agronomic suitability of land for organic growing of suitable for the region crops. There were considered the potential threats of soil erosion, acidification and compaction. It was prepared land evaluation regarding the potential for growing grape and fruit, vegetable crops, meadows and pastures. It was found that the areas with altitude above 800 m are unsuitable for cultivation with fruit crops, which can be planted in areas with an altitude of 1800 m. Vegetable crops are not suitable to be cultivated in areas with altitude above 800 m are with the exception of late potatoes which may be planted in places with an altitude of 1800 m. It was found that the areas with altitude above 800 m are unsuitable for growing vines. The territories with altitude above 2400m are unusable for grassland.

Keywords: weather conditions; soil resources, agronomic suitability, land evaluation.

Intrduction

Agricultural practices are certainly one of the most important factors in the evolution of mankind. Since ancient times, for centuries and millennia, they have defined its social status (political, demographic, economic, etc.). There are no known civilizations without agricultural land, and those that have destroyed its productivity - have died.The natural conditions and resources of the Republic of Bulgaria (soil, climate, water, biota, relief, etc.) give it the advantage of being a developed country. For a long time, this advantage has been used actively, experience has been gaining, our country has even been a center of agricultural know-how. The two main conditions for successful agricultural development are scientific high-level service and a good agricultural policy. Kyustendil region has a centuries-old tradition in agricultural production. Much of the agricultural land in the area is occupied by orchards (mainly cherry and apple plantations) (Annual Report on the Status and Development of Agriculture, 2016). The area is located in Southwestern Bulgaria, with an area of 2.7% of the country's territory. It borders the regions of Sofia, Pernik and Blagoevgrad, and to the west - with the Republic of Macedonia and Serbia. The administrative, business and cultural center is the district of Kyustendil. Kyustendil district comprises 9 municipalities - Kyustendil, Dupnitsa, Bobov dol, Sapareva Banya, Rila, Kocherinovo, Nevestino, Boboshevo and Treklyano with total number of settlements 182. This report presents the geographical distribution of major agro-ecological characteristics (soil, climatic and their combinations) within the boundaries of Kyustendil region. They are the result of a large set of data resulting from years of observation and research.

Material and methods

Agroecological zoning in the municipalities of Kyustendil - Bobov Dol, Boboshevo, Kocherinovo, Kyustendil, Nevestino, Rila, Sapareva banya, Dupnitsa and Treklyano was made based on certain environmental characteristics, basic of which are: prevailing soil type; availability of moisture and

warmth in the area (vegetation period); extreme manifestation of certain climatic factors; altitude; relief features. For the purpose of the project the card for agri-environmental areas in Bulgaria was used, which is compiled from aggregated soil and climate information and is 1: 600,000 (Jolevski et al., 1980). Across the country there are 50 separated agri-environment area, of which 40 cover the agricultural fund, and 10 the forest one. Map of agri-environmental areas is digitized using advanced software programs and it allows the use of available digital information, adding new and visualization through the map material. The electronic map of Agri-environment areas (georeferenced) is imposed on municipal boundaries. The soil, climate and agro-climatic data was processed by GIS in order to spatially delineate the most homogeneous regions. In each municipality there are formed from 2 to 3 and more areas. As noted above they are separated based on differences in soil and agro-climatic conditions. Information on soils is represented by "soil map of Bulgaria" in scale 1: 200 000. Climatic conditions are described, taking into account the most important indicators-air temperatures and rainfall. Data is geathered from weather and rain gauges from the study area. The mentioned municfipalities are part of the transitional continental climatic sub-region (Sabev, L. 1959). In this sub-region, which lies entirely south of the Balkan Mountains, winter is markedly softer than in temperate continental sub-region, and the summer is generally hot. The rainfall regime also has continental character - with summer maximum and winter minimum. However, the difference between summer and winter rainfall is very low - averaging about 6-8% of their annual amount as in the southern parts of the subregion practically disappears. Moreover many local minima of precipitation already moved from the winter months - to August or September. All these features, together with a relatively mild winter and low snowfalls shows that the climate of this subregion as a transition between moderate continental North Bulgaria and mild climate of our most southern areas. For the differentiation of the climatic conditions in these areas play a special role primarily physiographic conditions in different parts of the transitional continental climatic zone.

Table 1. Average monthly and annual air temperature in ^{0}C

Station	Months												Av. annual t
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Donitz	-0,9	1,3	4,7	10,6	15,3	18,8	21,0	20,5	16,7	11,4	6,5	1,5	10,6
Kiustendil	-0,8	1,7	5,7	11,4	16,0	19,5	21,8	21,5	17,4	11,8	6,7	1,7	11,2
Nikolichevtzi	-1,3	1,1	5,1	10,7	15,1	18,7	20,9	20,5	16,3	10,8	6,0	1,1	10,4
Rila	0,1	2,4	6,1	11,6	16,2	19,7	22,2	21,9	18,1	12,4	7,3	2,3	11,7

Table 1 shows average monthly and annual air temperature in certain places in the Kyustendil region. In the plain parts the lowest winter temperatures are in January in the range of 1,3 to 0,1 ^{0}C ^{0}C, and the highest summer temperatures are in the range of 20.5 to 22.2 ^{0}C. In the higher mountain areas, average temperatures in January reach from minus 110 to minus 7 ^{0}C (Kyuchukova, M. et al. 1983).

Table 2. Average monthly minimum air temperature in ^{0}C

Station	Months											
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Dupnitza	-14,4	-11,8	-7,4	-2,0	3,3	7,2	8,9	7,5	3,2	-1,1	-4,8	-11,3
Kiustendil	-13,8	-11,7	-7,5	-1,0	3,9	7,9	9,6	9,0	4,3	-0,6	-5,1	-10,9
Nikolichevtzi	-15,8	-13,2	-8,3	-2,9	2,6	6,4	7,8	6,6	2,2	-2,5	-6,1	-11,4
Rila	-12,7	-10,7	-7,0	-1,2	4,1	8,2	9,8	9,1	4,7	-0,1	-4,5	-10,3
Rila monastery	-15,9	-14,3	-11,8	-5,3	-0,5	3,0	4,5	3,8	0,2	-3,1	-7,3	-11,8
Osogovo rest house	-16,3	-15,3	-13,6	-8,0	-1,2	2,0	4,5	4,1	0,9	-4,3	-9,0	-13,7

Minimum air temperature occurs most frequently in the hours before sunrise, when the radiation cooling of the underling surface is strongest (Table 2). The average monthly minimum temperature gives an indication of the average range (in a month), between which oscillates the air temperature during the day.

Table 3. Average monthly maximum air temperature in ^{0}C

Station	Months											
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Dupnitza	3,1	6,2	10,5	16,7	21,5	24,9	27,6	27,8	24,1	18,1	11,3	5,3
Kiustendil	3,4	6,6	11,0	17,5	22,2	25,4	28,5	28,1	24,9	18,5	11,3	5,4
Nikolichevtzi	3,4	6,5	10,8	17,2	21,9	25,6	28,2	27,8	24,6	18,4	11,5	5,6
Rila	4,3	7,3	11,7	17,7	22,5	26,0	28,7	28,8	25,3	19,1	12,3	6,5
Rila monastery	1,4	3,3	7,3	12,7	17,2	20,5	23,1	23,8	19,9	14,8	9,2	3,2
Osogovo rest house	-1,0	0,4	2,6	7,0	12,1	15,5	18,0	18,6	15,1	10,6	6,7	1,5

The data on the average monthly maximum air temperature were obtained from the hour maximum temperatures averaged over a sufficiently long period of time. The maximum temperature of the air is influenced to a lesser extent on the shape of the relief than the average hour temperature as it normally occurs in the afternoon (13-15 hours) when turbulent air exchange is the highest (Table 3) (Koleva, E., Peneva, R. 1990).

Table 4. Average monthly and annual rainfall (mm/m^2)

Station	Months												Annual amount
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Dupnitza	45	38	37	61	69	79	52	40	38	56	61	51	627
Kiustendil	48	45	42	52	68	65	54	36	38	59	62	55	624
Rila	43	38	38	56	62	69	41	38	36	55	62	56	594
Vaksevo	52	47	45	58	69	72	50	39	38	62	68	62	662
Kocherinovo	45	38	36	52	56	59	41	35	33	55	62	52	563
Osogovo rest house	74	65	57	68	92	83	58	45	48	81	90	87	848

Rainfall in Kyustendil region during the year are characterized by a pronounced spring and autumn peak (May and June, November and December) and winter and summer minimum. The total annual rainfall is smallest in Kocherinovo (563 mm/m^2), and the highest one is for the mountainous parts of the regions (848 mm/m^2). The amount of rainfall by seasons is presented in Table 4. In the lower, plains areas, soil moisture is inadequate, especially during the critical summer period (July and August), which adversely affects the crop. Drought is observed in the month September.

Table 5. Average monthly and annual relative humidity (%)

Station	Months												Annual amount
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Dupnitza	79	75	69	61	64	63	57	57	59	69	77	81	68
Kiustendil	82	78	70	63	64	63	58	56	63	72	80	83	69
Rila	80	75	69	63	63	62	57	56	60	69	77	81	68
Nikolichevtzi	82	76	69	64	67	67	62	60	68	75	79	82	71
Osogovo rest house	83	80	80	75	74	75	71	67	71	74	82	83	76

On the table are presented on a monthly and annual average daily relative humidity. The relative humidity is characterized by high stability of the monthly average values. This feature is more stable in winter compared to summer (Table 5) (Kyuchukova, M. et al. 1979).

Table 6. Duration (days) and temperature sum of the periods of detention sustainable temperatures > 0 ^{0}C, > 5 ^{0}C,>1 0 ^{0}C, >15 ^{0}C

Station	Duration (days)				Temperature sum (C x days)			
	0 ^{0}C	5 ^{0}C	10 ^{0}C	15 ^{0}C	0 ^{0}C	5 ^{0}C	10 ^{0}C	15 ^{0}C
Dupnitza	340	251	194	133	3905	3710	3285	2520
Kiustendil	346	259	201	140	4110	3930	3500	2730
Nikolichevtzi	333	252	191	129	3815	3705	3200	2385
Rila	365	266	216	146	4270	4070	3710	2880
Rila monastery	286	213	141	39	2630	2455	1925	615

Temperature amounts and periods indicated are derived by collecting temperature amounts for the respective months. The indicators are used in the agro-climatic assessment of certain territory and to what extend they can ensure the ripening of the crops. As the 10 ^{0}C spring is an indication of the occurrence of the favorable moment of sowing of the thermophilic spring crops (maize, etc.). During this time begins the development of the vine. Lasting shift in temperature over 15 ^{0}C spring is usually taken as the end of spring and early summer. Temperature sums (50, 100 and 15 ^{0}C) serve to evaluate the conditions for the ripening of various crops. Zoning in temperature conditions lands of municipalities located in Kyustendilska and Dupnitsa Plain fall in moderately warm sub-belt. In hilly parts to semi temperature amounts above 10 ^{0}C are 1925 ^{0}C and divided by temperature conditions they fall to moderately warm to moderately cool sub-belt. In such thermal conditions have capabilities for raising a thermophilic cultures (mostly early). In high temperature areas amounts above 10 ^{0}C are 1235 ^{0}C and divided by temperature conditions they fall into the cool climate region (Kyuchukova, M. et al. 1983). Zoning in terms of land humidity municipalities located in Kyustendil and Dupnitsa Plain fall into the "dry zone", the difference between money and precipitation (mm) for the period from June to August showed a deficit of minus 200-300 humidity and less what allows up to 90% for the cultivation and maturation of crops, but also the need for irrigation. In the hilly parts and semi hilly the humidity conditions are defined as "weak drought" as the difference between the vapor and precipitation (mm) for the period from June to August showed a deficit of humidity minus 100-200 mm. In alpine regions the conditions of humidity are defined as "wet" as the difference between the vapor and precipitation for the period from June to August showed a deficit of humidity less than 100 mm and less (Hershkovich, E.1970, 1984).

Results and discussion

Agri-ecological zoning of municipalities in the Kyustendil region

1. Agroecological zoning in municipality Bobov dol (Table 8)

The municipality is divided into two distinct agro-ecological regions - Sofia-Pernik (IV_1) and Kyustendil (IV_2). In Sofia-Pernishki area (IV_1) most widely spread are Hromic Luvisols, Haplic Vertisols, Fluvisols and Leptic Hromic Cambisols + Rendzic Leptosols. Hromic Luvisols which have weakly potent /20-25 cm/ humus layer, a powerful profile /100-220 cm/, medium to heavy sandy clay mechanical composition and weakly acidic media reaction /pH in H_2O ranges from 5.4 to 6.6/. Some of these soils are affected by erosion. Haplic Vertisols are distinguished by a large capacity of the humus layer /70-75 cm/ and profile /180 cm/, heavy mechanical composition. The content of organic matter in the surface horizon is about 3%. The soils are characterized with neutral to weakly alkaline media reaction /pH 7.0-7.5 in H_2O/. Fluvisols are distributed mainly along the Struma River and its tributaries. It is characterized by a fluctuation in the range of their individual performance, but are mainly characterized by the average power of the humus layer /30-40 cm/ and the power of the profile - 80 cm, average sandy clay mechanical composition, slight to moderate availability of organic matter /1.0 - 3.0% of humus/ and a weakly acidic to alkaline media reaction /pH 5.5-8.0 in

H_2O/. In the region there are also Leptic Hromic Cambisols + Rendzic Leptosols, formed on the non-carbonate material. They are characterized by low power humus layer / 20-22 cm / and soil profile /40-50 cm/, mild to moderate sandy clay mechanical composition and low availability of organic matter /1.0-1.5% humus/. The reaction media reaction is slightly acid /pH 5.5-6.5 in H_2O/. These soils are not suitable for growing organic production. Leptic Cambisol, distributed in the area, have a low power humus layer /about 20 cm/ and profile in the range of 60-70 cm. They are characterized by a soft, skeletal mechanical composition, low humus content /1-2% humus/ and acidic media reaction /pH at about 5.0 in H_2O/. In Kyustendil region (IV_2), the soil cover is composed of different soil types, which are analogous to those described for the Sofia-Pernishki area. It is worth noting here that Haplic Vertisol occupy a smaller area while Hromic Luvisols are more prevalent. Haplic Vertisol are distinguished by a small power of the humus layer, lighter skeletal mechanical composition, a low humus content and a larger area occupied by eroded lands. Rendzic Leptosols are poor in organic matter and in skeletal.

2. Agroecological zoning Municipality Boboshevo (Table 8)
There are three distinct regions in the municipality - Kyustendil (IV_2), Rila-Pirin (VI_6) and High Rila-Pirin (VII_2). Region Kyustendil (IV_2), has already been described above. Rila-Pirin region (VI_6) covers the higher parts of the Rila and Pirin mountains - from 800 to 2000 m altitude. The relief is with alpine character. Most common in the region are Leptic Cambisol. They are characterized by low power humus layer /10-15 cm/ and profile /50-60 cm/, slight mechanical composition, low to medium availability of humus /2.0-3.0% humus/ and acidic media reaction /pH in H_2O - 5.3/. Most of these soils are subject to erosion. High Rila-Pirin region (VII_2) comprises the highest treeless parts of Rila and Pirin mountains - over 1700-1800 m altitude. The relief is alpine. In specific environmental conditions here are formed Umric Leptosols or Leptic-humic Umrisols. They are characterized by powerful /40-50 cm/ humus horizon and moderately profile /55-90 cm/, light, rock mechanical composition, very rich in organic matter /12-23% humus/ and acidic media reaction /pH in H_2O - 5.5/. There is also erosion.

3. Agroecological zoning in the municipality of Kocherinovo (Table 8 and Figure 2)
The municipality is divided into two separate areas - Kyustendil (IV_2), Rila-Pirin (VI_6), already described.

4. Agroecological zoning in the municipality of Kyustendil (Table 8)
The municipality is divided into four regions - Sofia-Pernik (IV_1), Kyustendil (IV_2), Tran-Osogovski (VI_3) and High-Osogovski (VII_3)._Sofia-Pernik region covers the territory between Milevska, Rila and Malashevska mountains. The landscape is as mountainous as well as valleys and determines the manifestation of erosion. The soil is comprised of similar differences properties as previously described neighboring Agroecological region IV_1. However, unlike here Haplic Vertisol occupies a smaller area while Hromic Luvisols are more prevalent. The latter are characterized by a smaller power of the individual horizons, lighter and skeletal mechanical composition, a low humus content and a larger area of the eroded land. Tran-Osogovski area covers the highlands of Western mountain suburbs: Ossogovo Vlahina, Malashevska. The terrain is rugged, soil forming materials are presented mainly by crystalline schists and very few granites, sandstones and others. The soil is occupied by Leptic Cambisol. They are characterized by low power humus layer /10-15 cm/ and profile /50-60 cm/, lighter mechanical composition, slight to moderate humus content /2-3%/ and acidic media reaction /pH in H_2O - 5.3/. High-Osogovski area takes the treeless alpine areas in Kyustendil over 1700-1800 m. The relief is alpine. In this specific environmental conditions here are formed Umric Leptosols or Leptic-humic Umrisols. They are characterized by powerful /40-50 cm/ humus horizon and moderately profile /55-90 cm/, light, rock mechanical composition, very rich in organic matter /12-23% humus/ and acidic media reaction /pH in H_2O - 5.5/. There is erosion processes.

5. Agroecological zoning Municipality Nevestino (Table 8)
The municipality is divided into two distinct agro-ecological regions: Kyustendil (IV_2) and Tran-Osogovski (VI_3) - already described.

6. Agroecological zoning in the municipality of Rila (Table 8)
The municipality is divided into three agro-ecological regions: Kyustendil (IV_2), Rila-Pirin (VI_6) and High Rila-Pirin (VII_2) - already described.

7. Agroecological zoning in Sapareva bathroom (Table 8)
The municipality is divided into three agro-ecological regions: Kyustendil (IV_2), Samokovsko-Srednogorski (VI_5) and Rila-Pirin (VII_2). Soils in Kyustendil region and Rila-Pirin region are already described above. The relief of the territory of Samokovsko-Srednogorski area is mountainous. The altitude is from 630 to 1400 m. The most widely spread are Leptic Cambisol. They are characterized by low power humus layer /10-15 cm/ and profile /50-60 cm/, lighter mechanical composition, slight to moderate availability of humus /2.0-3.0%/ and acidic media reaction /pH in H_2O - 5.3/. Most of these soils are subject to erosion.mAt the foot of the slopes, on the talus cone, there are wide areas occupied by Dystric-sceletic + Eutric-scletic Fluvisols. They are characterized by moderately humus layer /50 cm/, deep profile /120 cm/, stoned mechanical composition, low humus content /1-2%/ and a weakly acidic to neutral media reaction /pH is from 6.5 to 7.5/. In this region widely spread Leptic-cromic Luvisols.

8. Agroecological zoning in the municipality of Dupnitsa (Table 8 and)
The municipality has five agro-ecological regions: Sofia-Pernik (IV_1), Kyustendil (IV_2), Samokovsko-Srednogorski (VI_5), Rila-Pirin (VII_2) and High Rila-Pirin (VII_2) - already described.

9. Agroecological zoning in ObshtinaTreklyano (Table 8 and)
The municipality has three agro-ecological regions: Sofia-Pernik (IV_1), Kyustendil (IV_2) and Tran-Osogovski (VI_3) - already described.

Potential threat for soil erosion
The predominant relief of Kyustendil region is mountainous and valleys, heavily indented in the northern and western parts. More than 1/5 of the lands in the area (22%) are located at more than 1200 m above sea level. Most of those lands are in the municipalities of Rila and Sapareva bathroom - respectively 69 and 47% of their area and in Treklyano, Dupnitsa and Kyustendil occupy 15 to 23 percent. Most of the remaining land in Kyustendil have a slope above 150. Their involvement has been greatest in municipalities Kyustendil Kocherinovo Boboshevo Nevestino and Treklyano (37, 39, 41, 47 and 51% of the surface), 17-20% in Bobovdol, Rila and Sapareva bath and 8% Dupnitsa Municipality. The proportion of land with a slope of 3-6 and 6-90, which are the main part of agricultural land is only 17% (at 28% of the country). Their involvement is greater in municipalities Dupnitza Bobovdol (31 and 51%), from 16 to 22% in Kyustendil Treklyano, Nevestino Kocherinovo and Boboshevo and 4-9% in Rila and Sapareva bath. The total area of arable land with varying degrees of erosion risk in Kyustendil 90 995.1 ha. 19 out of these 101.4 ha (21%) are arable land with very low erosion risk and land at an altitude of more than 1 200m which are not going to have anty erosion treatment. On the remaining 79% (71 893.6 ha) of arable land to permanent use of land - fields, permanent crops (orchards and vineyards) and pastures are recommended basic protivoerozinni practices depending on the degree of erosion risk, which should limit the prevention of erosion to acceptable limits. This can be achieved by applying the soil conservation crop rotations (crop rotation by a fused surface and row crops), establishment of grass buffer strips (in the fields of row crops and areas with perennials) and others. Terracing as erosion control practices recommended for arable land with high erosion risk. Paving run-off holding furrows in pastures and implementation for improvement activities such as cleaning of stones and shrubs, planting, fertilizing, controlled grazing, etc. (Ruseva Sv. L. Lozanova, D. Nekova and others. 2010).

Table 8. Agroecological zoning in municipalities from Kyustendilska area

Municipality	Agro-ecological area	№ /index/ of AER
Bobov dol	Sofia-Pernik Kyustendil	IV_1 IV_2
BOBOSHEVO	Sofia-Pernik Kyustendil	IV_1 IV_2
Kocherinovo	Kyustendil Rila-Pirin	IV_2 VI_6
Kyustendil	Sofia-Pernik Kyustendil Tran-Osogovski High-Osogovski	IV_1 IV_2 VI_3 VII_3
Nevestino	Kyustendil Tran-Osogovski	IV_2 VI_3
Rila	Kyustendil Rila-Pirin High-Rila-Pirin	IV_2 VI_6 VII_2
Sapareva Banya	Kyustendil Samokovsko-Srednogorski Rila-Pirin	IV_2 VI_5 VI_6
Dupnitsa	Kyustendil Samokovsko-Srednogorski Rila-Prin High-Rila-Pirin	IV_2 VI_5 VI_6 VII_2
Treklyano	Sofia-Pernik Kyustendil Tran-Osogovski	IV_1 IV_2 VI_3

Potential threat from acidification

Acidic soils are referred to soil with a chemical imbalance because they contain excessive amounts of exchangeable hydrogen, aluminum, iron and manganese which are toxic to plants and are one of the reasons for the low structural stability of these soils. Particularly vulnerable are Leptic-albic Luvisols, Leptic Cambisols, Leptic Cambisols or Humic Leptosols, Umbric Leptosols or Leptic-humic Umbrisosls, distributed in Kocherinovo. The possible measure to prevent such processes are: introduction of finely ground lime materials (lime) for neutralizing toxic to plants acidity.

Potential threat from soil compaction

Under the conditions of modern intensive farming soil density is exposed to intense impact and change under the influence of agricultural machinery and vehicles who repeatedly go on the soil surface in the growing and harvesting of crops. To secondary soil compaction leads especially when working at high soil moisture, especially if the soil has heavier mechanical composition. To prevent these processes there is needed a proper selection of agricultural machinery and the use of new technologies, in which the number of operations decreases (minimum tillage) or to the soil generally not processed (zero tillage); applying a profiling autumn plowing depth 30-35 cm reverse layers and similar. Such soils in the region are: Haplic Vertisols, Hromic Luvisols and Leptic-albic Luvisols (Atanas Atanasov at al., 2014).

Conclusions

It was prepared spatial distribution of groups of crops by municipalities in Kyustendil according to the procedure of FAO. The attached map material shows the suitability for organic farming of vineyards and fruit orchards, vegetable crops and grassland /Figure 1/. It was found that the areas with altitude above 800 m are unsuitable for cultivation with fruit crops, which can be planted in areas with an altitude of 1800 m. Vegetable crops are not suitable to be cultivated in areas with

altitude above 800 m are with the exception of late potatoes which may be planted in places with an altitude of 1800 m. It was found that the areas with altitude above 800 m are unsuitable for growing vines. The territories with altitude above 2400m are unusable for grassland.

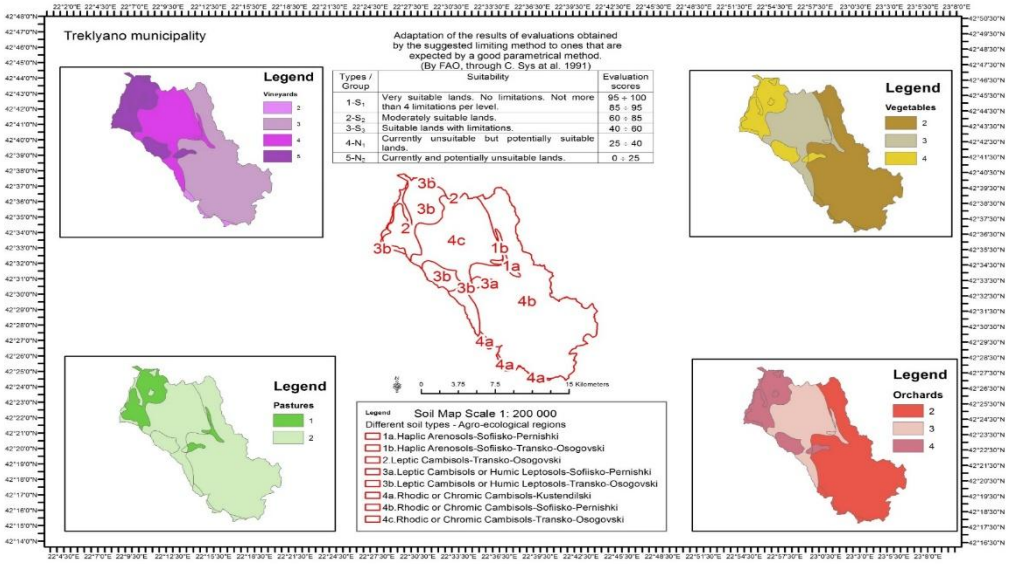


Figure 1. Soil map and suitability by crop groups in Treklyano municipality

In the consideration municipalities, the suitability of land for cultivation of wheat are in a wide range - land evaluation are in the range 30-75 marks, corn - 25-55 marks, tomato - 20-75 marks, pepper - 40-80 marks, cabbage - 30-80 marks, cucumber - 40-80 marks, apples - 30-80 marks, cherries - 40-80 marks, cherries - 40-80 marks, potato - 60-90 marke, grassland and pastures - 65-80 marks, hazelnuts - 40-80 marks, raspberries - 60-80 marks and vineyards - 0-80 marks). Lower quality assessment ratings are the result of the presence of shallow and eroded soils, acid or gravel which acts negatively on the crop. Soil from the high part, are suitable, but for a limited number of crops (hazelnuts, potatoes cultivated blueberry, strawberry, raspberry, herbal plants cultivated rose hip, etc.) (Petrov E., at al. 1988; Maps of agro-climatic areas in Bulgaria and coefficients of suitability for different crops, M 1: 400000, 1986). Soil resources in the municipalities of Bobov dol, Boboshevo, Kocherinovo, Kyustendil, Nevestino, Rila, Sapareva bathroom, Dupnitsa and Treklyano are varied. In the regions there is a deep, fertile soils and shallow-land unsuitable for agriculture. The great wealth in these communities have thermal resources, water resources (irrigation possibilities) and purity of nature. In municipalities of Kyustendil, Nevestino, Boboshevo, Kocherinovo are present light alluvial soils, which are very suitable for vegetables and in particular for fruit trees. In these regions there is a specific microclimate that allows the development of fruit (apples, cherries, pears, plums, raspberries) and obtaining products with unique taste. In secured irrigation, even small areas can be very effective for the owners. Environmental conditions in the region are suitable for organic farming, as there is no pollution and large industrial enterprises.

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