OPPORTUNITIES FOR SUSTAINABLE DEVELOPMENT OF AGRICULTURE IN RAZLOG MUNICIPALITY, BLAGOEVGRAD DISTRICT

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Abstract

One of the challenges facing the Municipality Razlog at the current development of the country is how to use the land in agriculture, without causing irreversible degradation of their quality or impair their multi-functions. Owners and users of land / soil must be familiar with the degradation processes, but also the necessary measures which, if integrated with Agricultural practices can help restore or maintain the quantity of soil resources. In many cases up to now been prevented from carrying out the necessary actions or make investments to improve or maintain quality of the land, owing to lack of funds and lack of adequate knowledge of the problem. The goal of this work is to achieve sustainable land management in the Municipality Razlog.

Key words: *geographic information system of soil resource (gisosr), degradation processes, remote sensing methods*

1. INTRODUCTION

Drought is a major problem faced by many nations inevitably worldwide. Droughts are observed in both regions climate is characterized by heavy rainfall, and in areas where rainfall is scarce.

Drought means land degradation in arid, semi-arid and sub-humid areas resulting from various factors, including climatic variations and human activities. Usually differ several types of drought:

Atmospheric - besides low rainfall experiences high temperatures and low humidity. In this drought plants are located in the most adverse conditions.

Hydrological - a long period of dry weather, causing a shortage of water due to a reduction of water levels in the river below normal and decreased moisture in the soil or groundwater level.

Soil drought - is a long period in which the water balance of the soil and plant ecosystems are deteriorating physiological condition of plants and yields fell sharply. Root layer dries up and the plants suffer from water shortages.

Most radical way to combat drought is irrigation. A fundamental pillar of any system of agriculture in rain fed conditions are events to combat soil erosion and accumulation and productive use of moisture in it.

In many areas of the country, including a drought climate, a significant part of agricultural areas are prone to erosion, resulting in the fields exported huge amounts of nutrients ground dry and therefore accelerate the onset of soil drought. Plants begin to experience shortages of food and moisture first of eroded soils.

Especially important for the accumulation of moisture in the soil has the proper tillage and deep autumn plowing.

Floods are common natural disasters in the Republic of Bulgaria. They cause enormous damage because they affect populated areas, industrial areas, productive farmland and engineering infrastructure.

Floods can be:

Natural flooding - caused mainly by melting of ice and snow, in rain or during distrains of ice formation or freezing;

Technologic floods - caused by other influences - in damage to the hydro facility, which could lead to an accident or to prevent critical situations in hydro facility.

The aim of this work is an evaluation of agroecological resources of agricultural land in Razlog for legume crops, mostly for beans.

To achieve the intended objective GIS of Soil Resources (GISoSR) are developed for the studied object. The following methods are used:

- risk assessment of drought and flooding for sustainable agriculture in Razlog municipality
- SWOT-analysis in sector economic development - agriculture in Razlog municipality;
- remote Sensing;
- literature and internet sources.

2. OBJECT AND METHODS

2.1. Physical-geographic characteristics of Razlog municipality.

Razlog municipality is located in southwestern Bulgaria in the Razlog valley in the Mesta River, at the foot of Pirin, Rila and Rhodopean Mountains. Through the gorge "Momina klisura" south connects to Gotse Delchev valley and in the west passed and laid low in the saddle "Predel". By its geographical location it can it may be defined as a relatively closed community – fig. 1.

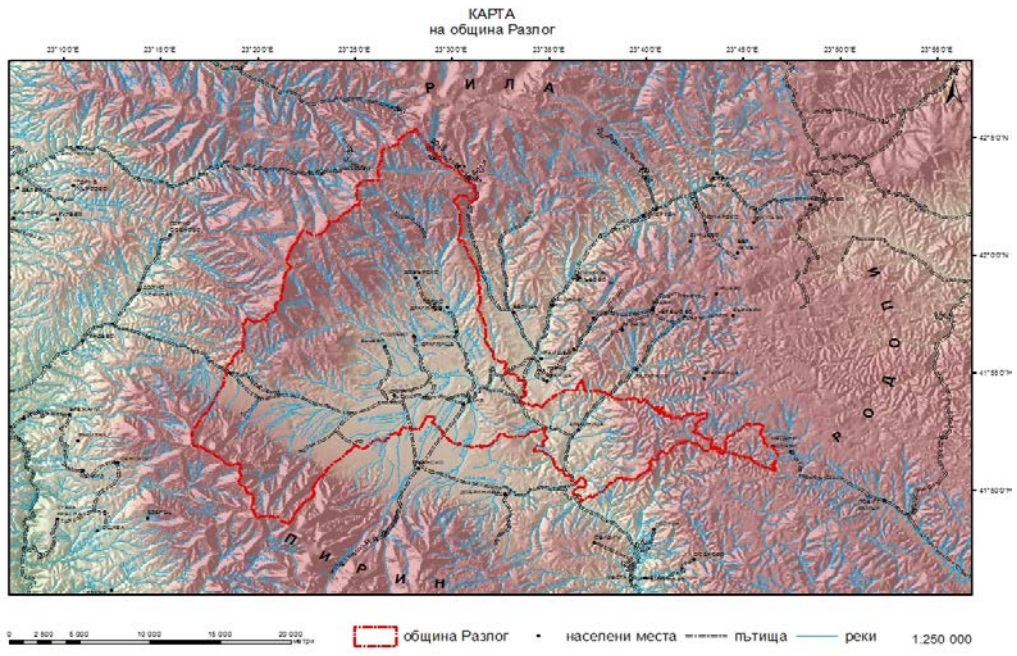


Fig. 1. Map of Razlog municipality

Razlog Valley is one of the highest valleys in southern Bulgaria. In the midst of the valley part is almost flat terrain with a slight slope to the east to the Rodopean Mountain. North is hilly and surrounded it high parts of the Rila and Pirin are typical alpine species.

Agricultural areas in the municipality occupy 165,305 acres - 37.5 % of the total area and the forest 257,592 ha or 58.5 %.

Plant diversity in the municipality is due to the high difference in altitude. Forestland is rich in tall pine trees (pine, fir and alder) and deciduous forests (beech, oak). The lower parts are occupied by meadows and pastures, and along the ridges of mountains and pastures squat. Forests, grasslands and arable lands are having potential importance to economic development of the municipality as at present and for the next seven years. They are the basis for the development of modern agribusiness, timber and wood processing.

The most widespread in the valley have a group of alluvial and deluvial meadow. They occupy the lowest part of the hollow-level and low terraces of White River, p. Glazne and others.

Deluvial and alluvial meadow soils are light mechanical composition. Characterized by very low humus content and total digestible forms of nitrogen, phosphorus and potassium. South of Razlog on yellowish brown clays are formed maroon soils. Hilly part of the valley is occupied exclusively by shallow, heavily eroded cinnamon forest soils formed on massive non-carbonate rocks. The soils are poor in nutrients and have a slightly acidic.

2.2. Agro-climatic zoning

Climatic factors heat, light and moisture act comprehensively on the development and growth of plants. How more favorable is the combination of these factors in a given location, the climate is more favorable, richer, and more fertile. In a study of this combination may differ agro-climatic regions, differing among themselves in terms of development and formation of the yields of agricultural crops. As a major determining factor for the formation of agro-climatic regions we perceive temperature regimes. At them depended the development and maturation of the plants.

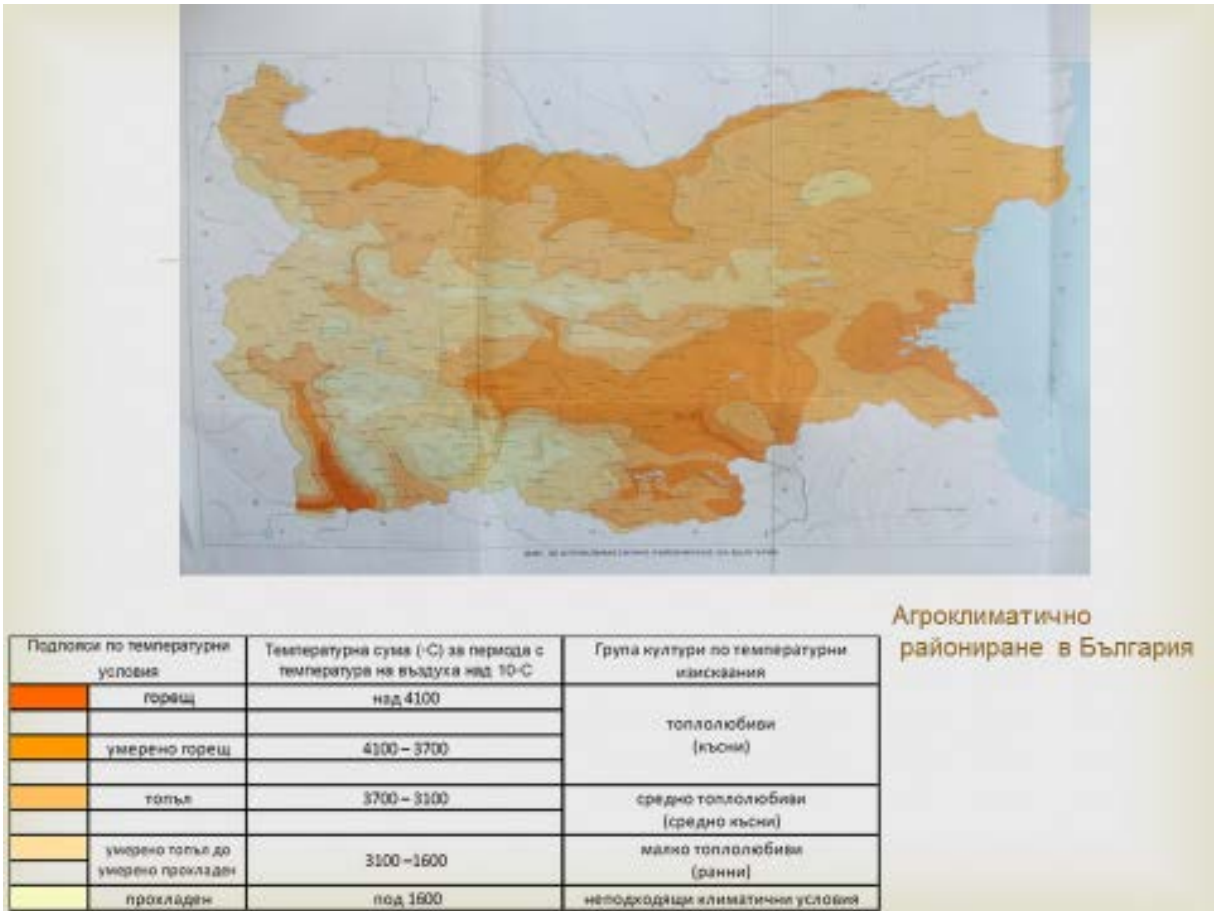


Fig. 2. Agro-climatic zoning in Bulgaria



Fig. 3. Phenological and forest phenological stations.

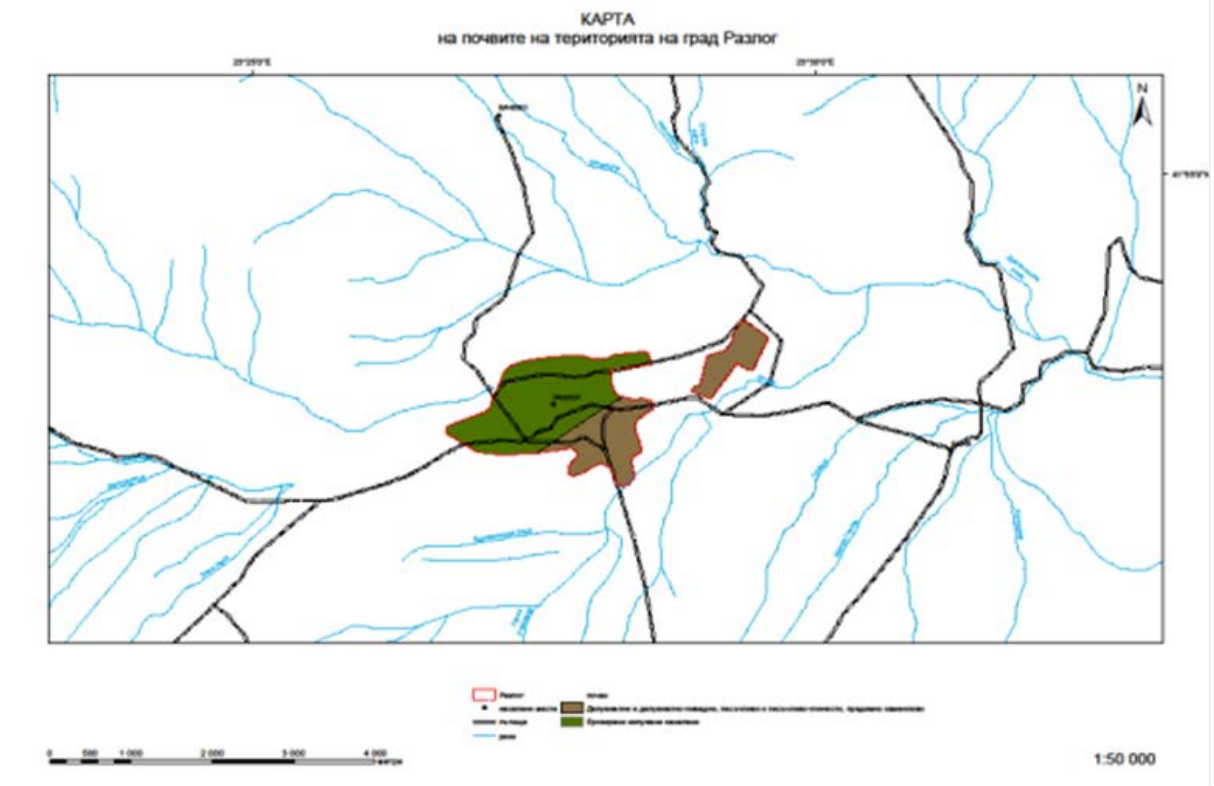


Fig. 4. Soil map of Razlog municipality.

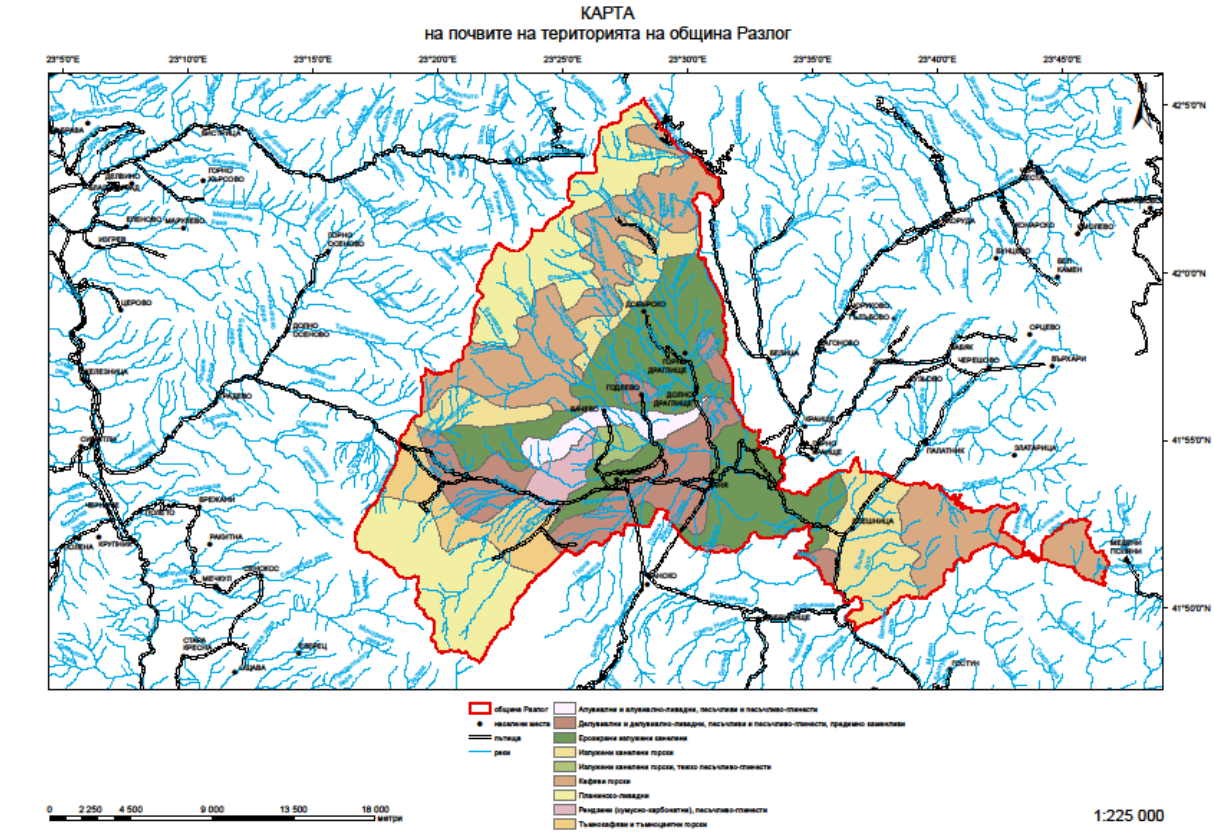


Fig. 5. Soil map of Razlog municipality.

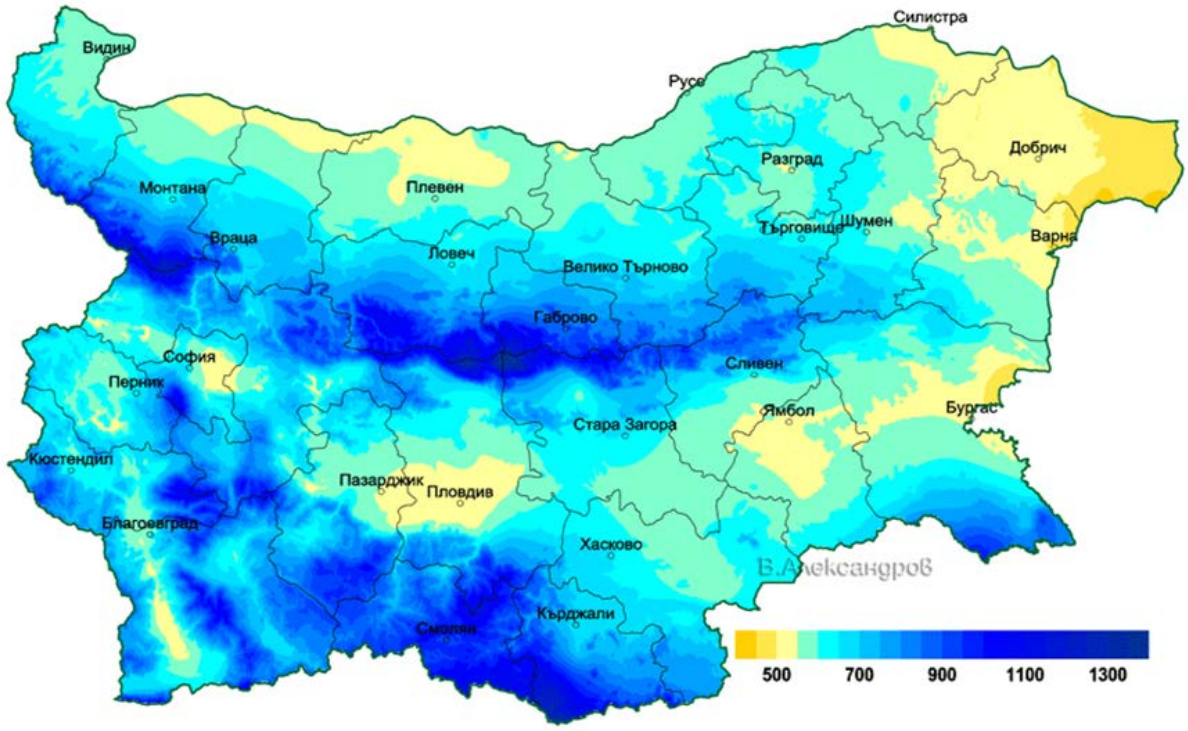


Fig. 6. Map of annual rainfall of Bulgaria.

When heavy rains with very high amount have negative influence on crop - worsened soil structure and conditions for plant respiration, some of the plants died, the productivity of the crop falls, gets to water erosion, etc.

Regionalization of cultures is to identify the most appropriate and correct ratio between:

- climatic and soil characteristics of the different regions and even micro, the specific requirements of the crops to the characteristics of the environment,
- potential environment to provide the best conditions for growth and development of crops
- potential yield
- capacity of farm production and use of agricultural products.

2.3. Agro-ecological regions of Bulgarian soils

The agro-ecological regions of the Bulgarian soils - [Gurov, Artinova (2001)], are presented in Fig. 7 and the agro-ecological regions in which the municipality falls - in Fig. 8.

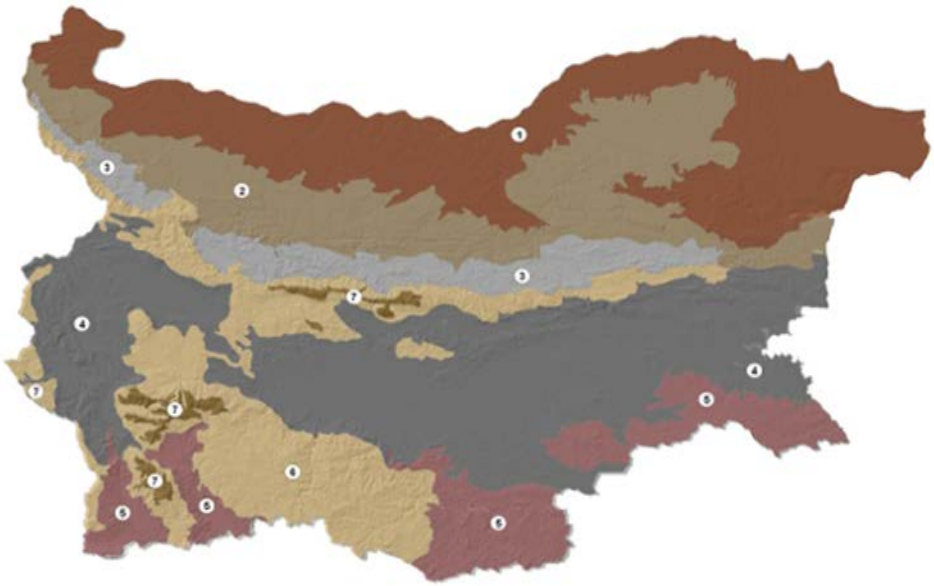


Fig. 7. Agro-ecological zoning in Bulgaria

Legend:

1. Area of chernozems;
2. Area of gray-brown forest soils;
3. Area of gray-brown podzolic soils;
4. Vertisols and cinnamonic forest soils;
5. Area of cinnamon forest soils of transitional Mediterranean subarea;
6. Area of the brown mountain forest soils;
7. Area of mountain-meadow soils;

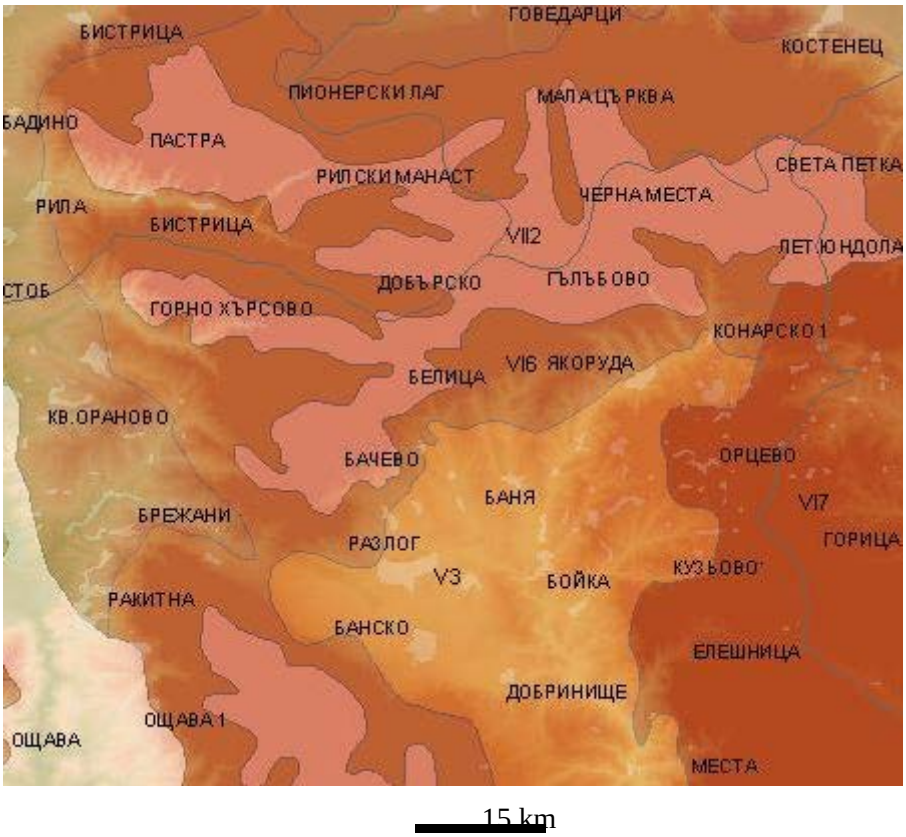


Fig. 8. Agroecological regions in the municipality territory.

Legend:

1. V3 – Razlog region
2. (VI6) - Rila-Pirin region
3. (VI7) - Rhodope region
4. (VII2) –Rila-Pirin high Mountains region

V3 – Razlog region - Razlog agroecological region occupies Bansko and Razlog valley. In terms of relief it did not differ from the previous two areas, but in a much higher altitude, which makes a significant impact on its climate characteristics. The main soil types are normal and eroded leached cinnamon forest soils, shallow soils and maroon-deluvial soils. On morphological characteristics and properties do not differ from the previous two regions. The area falls within the same climatic region of Mesta, but its temperature resources are more limited. The average annual temperature is 8.9 ºC and the temperature sum of the growing period is 3100 ºC. The annual rainfall is 670 mm and the deficit in the balance of atmospheric humidity for growing season is about 280 mm.

The median (agronomic) bonitet ball for the region is 42 - group "medium lands" Table 1. The most suitable conditions for potatoes, grasslands productivity class 66-65 ball, i.e. group "good land" wheat - 57 ball and 40 ball tobacco. Estimates of other cultures they belong to the group "poor" and “unsuitable land” 'average score is similar to the previous area, but the area of shallow, stony soils eroded and is larger and thermo-insurance - significantly less.

Table 1. Bonitet (suitability) of soils in V3 Razlog AER.

Crops	**Bonitet (Suitability) (0-100)**
Wheat	57
Maize	21
Soybeans	11
Sunflower	21
Beet	30
Oriental tobacco	40
Potatoes	66
Alfalfa	22
Grasslands	65
Apple	30
Vineyards	14

(VI6) Rila- Pirin region [2] occupies areas with an altitude of 800 to 2000 m. It has alpine character. Soil forming materials are granites, gneisses, schists, limestones and their weathering products. The biggest is the participation of the brown mountain forest soils, which are similar to their peers' case treated areas but the humus horizon, is more powerful (20-60 cm) and darker colored. The annual rainfall is about 840 mm, such as about 440 mm falling during the growing season. The average annual temperature is around 5°C with temperature sum of the growing season around 2000°C. Agricultural land in this area is characterized by medium (agronomic) bonitet ball 52, i.e. bonitet group "middle lands", but it refers to the lower areas with an altitude of 700-800 to 900-1000 m, where climatic conditions still allow their growing (and here they favor the land of a strong Mediterranean influence). Outside the forest zone lands are unsuitable for normal land use, except for potatoes, pastures and meadows. The lower parts are suitable for potatoes and wheat productivity class 71 and 60 ball (i.e. the group "good lands". Less is the suitability of environmental conditions for grasslands, oriental tobacco, sugar beets, grapes, apples (credit rating ranging from 52 to 41 ball, i.e. the group "middle lands" for maize, sunflower and alfalfa productivity class in the group of „bad lands" and for soybeans - "unfit lands" - Table 2. Like other areas assessments land for different crops vary considerably, which is associated with altitude, the nature of the soil that is affected in varying degrees of erosion.

Table 2. Bonitet (suitability) of soils in VI6 Rila-Pirin AER.

Crops	Bonitet (Suitability) (0-100)	
	<=1000 meters a.s.l.	>1000 meters a.s.l.
Wheat	60	0
Maize	39	0
Soybeans	5	0
Sunflower	35	0
Beet	47	0
Oriental tobacco	46	0
Potatoes	71	71
Alfalfa	30	0
Grasslands	52	52
Apple	41	0
Vineyards	48	0

(VI7) Rhodope region [2] includes areas of Western and Central Rhodope. Soil forming materials are rhyolites, granites, crystalline schists and their weathering products. The soils are almost exclusively brown mountain forest. In their features they are too similar to its peer's Central forest mountain - Samokov region, but are slightly clayey (20-30 % physical clay). In terms of climate, the region is not uniform. In the lower parts of the valleys of the rivers, the average annual temperature is around 8-9°C, and higher in around 5°C. Temperature sum of the growing period is from 2800 to 3000°C with a low around 2000°C and for the higher elevations. Better warmth of this region allows the cultivation of tobacco, flax, potatoes and more to higher altitudes. Precipitations are from 700 to 1000 mm and humidity conditions are good. Total productive capacity of the land is characterized by medium (agronomic) bonitet score 48, which they attributed to bonitet group " middle lands", but for most crops credit rating refers to the lower areas. They may be graded as follows: most are suitable for potatoes (79 ball - group "good lands." Second are the grasslands and wheat (credit rating in the range of 57-55 ball, i.e. "medium lands"). Less is suitability for growing grapes, apples, sugar beets, corn, sunflower, oriental tobacco (credit rating ranging from 40 to 29 ball, i.e. to bonitet group "bad lands "and for alfalfa and soybeans – "unfit lands". Total productive capacity of the land group agro-ecological regions of the mountain brown forest soils are low. The mean average (agronomic) ball for the whole area is very low (18 ball) and it belongs to the group bonitet "unsuitable lands." As seen, the main difference in this soil group areas are mountainous brown forest soil, occupying areas with an altitude of 800 to 1500 m, where climatic conditions are favorable for agricultural production. In the lower parts of the area with an altitude up to 1000 m (which is no more than 20 % of the total area) can still grow a number of field crops, although with sufficiently satisfactory results (i.e. land are relatively low bonitet ball), while the higher areas the environmental conditions are suitable only for potatoes, pastures and meadows, raspberries, which respectively bonitet ball is higher - Table 3.

Table 3. Bonitet (suitability) of soils in VI7 Rhodope AER.

Crops	**Suitability (0-100)**	
	<=1000 meters a.s.l.	**>1000 meters a.s.l.**
Wheat	55	0
Maize	32	0
Soybeans	22	0
Sunflower	32	0
Beet	39	0
Oriental tobacco	29	0
Potatoes	79	79
Alfalfa	18	0
Grasslands	57	57
Apple	40	0
Vineyards	40	0

(VII2) –Rila-Pirin high Mountain region –High -Rila-Pirin region include the highest ridge treeless parts of Rila, Pirin and Vitosha Mountains above 1700-1800 m altitude. The terrain is alpine, alpine character. Soil forming materials are granite, syenite, crystalline schist, marble and limestone. The soils here are represented by turf mountain meadow and peat soils. They are similar to those described in the above area, but have a low power (30-60 cm), in skeletal and more acidic (pH 4.4-5.4 in H_2O).

Area, as well as the previous one, has unsuitable conditions for agricultural production. The average annual temperature is 3-4 ºC, the temperature sum of the growing period is about 150C. Annual precipitations here are about 1000 mm rainfall. Soil, climate and topography are extremely unfavorable, so they may grow to inferior grasses dominated by *Nardus stricta* (Achkov, Bozhinova, 1986). Productive capacity of the area for pasture and meadows are with bad credit rating - 26 bonitet ball. Average agronomic ball reaches the symbolic value of 2 ball - Table 4.

Table 4. Bonitet (suitability) of soils in VII2 Rila-Pirin high Mountain AER.

Crops	**Suitability (0-100)**
Wheat	0
Maize	0
Soybeans	0
Sunflower	0
Beet	0
Oriental tobacco	0
Potatoes	0
Alfalfa	0
Grasslands	26
Apple	0
Vineyards	0

2.4. Methods

The study used the tools of ArcGIS - ArcMap for the object of the study and SWOT - analysis in the economic development in sector agriculture [5, 6].

3. RESULTS AND DISCUSSIONS

3.1. Phenological development of beans

Beans are one of the most important legumes for us. Grown for the grain which contains 23 % proteins and 2.8 % fat and is one of the most important food of our rural and urban population.

Beans are polymorphic species of annuals, perennials and sometimes, climbing plants with thin stems and intertwined branches. The root system of beans is poorly developed and located in the topsoil.

The root system consists of a taproot and lateral branches that begin to form immediately after germination. Compared with other types of legume root system of beans has a low junction drilling and recovery capability. Its development is strongly influenced by external conditions, and particularly the structure of the soil.

Bean stalk is angular, the top is fleshy, later-fibrous, and at the end of the vegetation-solid. In common bean cotyledons during germination go over the soil surface, turn green and begin to assimilate. After they developed a couple of simple heart-shaped leaves. True leaves are lobed and are spirally arranged on the stem. Each leaf has six small stipule, two at the base of the main handle, two at the basis of the average sheet and one at the base of the side lobe.

The flowers are collected from 2 to 8 in clusters located in the base of the leaves or the top of the stem and branches thereof. Clusters can be simple, double and triple branched and are typically shorter than petiole. The petals are colored in white, pink, purple or variegated.

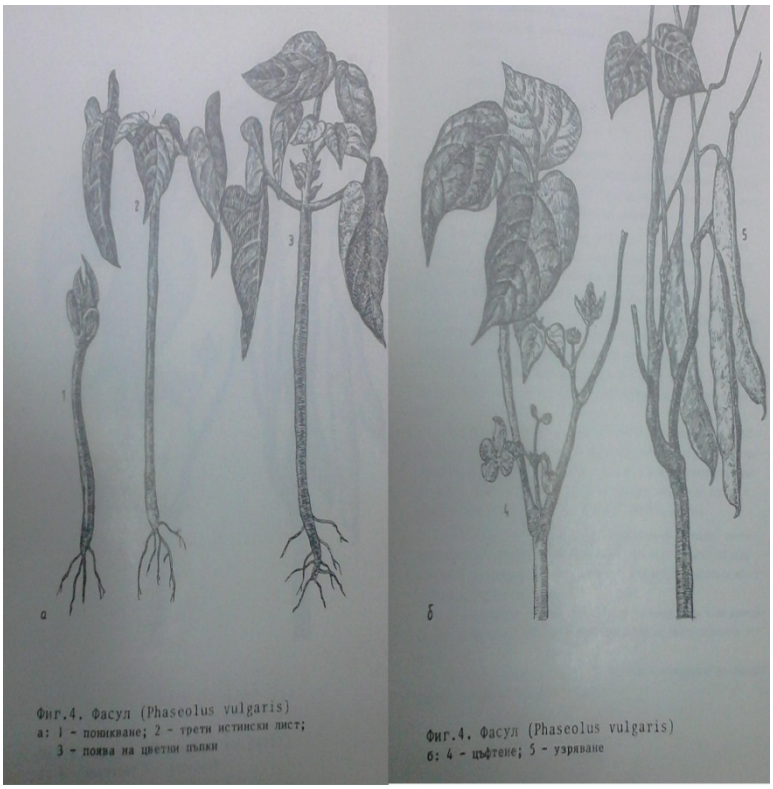


Fig. 9. Phases of development of the beans.

The fruit of the beans is beans, consisting of a helical fruit-leaf between the two halves of which are seeds. Shaped pods are straight or curved, flat or cylindrical.

Beans are warm-loving plant, easily damaged by low temperatures and grows well when the average maximum temperature does not exceed 30 ° C.

In terms of the light it is very demanding, especially in the early development when the slightest shading caused a prolongation of internodes, weakening the stem and leaf etiolirane with a consequent reduction in yield. At later stages of development sensitivity to light intensity decreases and the time of flowering and fructification scattered light is reflected even on the positive quantity and quality of the yield.

With respect to moisture is moisture-loving plant. The seeds require a relatively large amount of water for germination. Uneven maintain soil moisture during the growing season causes a reduction in yield. In low humidity before flowering reduces the number of colors during flowering reduces the number of pods, and during the ripening decreases the mass and accelerate the dynamics of maturation.

In terms of soil most suitable warm, drainage structures, with light mechanical composition, water permeable and deep groundwater soils.

The most suitable soil for it is gray forest, podzolic chernozems and deluvial soils, ventilated easily and quickly warm. They have a relatively light mechanical composition and their clay fraction is 25-30 %.

Suitable soils are typical and leached chernozems, dark, light gray and eroded soils, leached cinnamonic and alluvial soils. These groups are medium sandy-clay - content of clay fraction is of 30-40%.

Unsuitable are Haplisols rendzinas, dark leached cinnamonicv and other heavy, sandy-clay soils containing clay fraction over 40 %.

3.2. Analysis of the strengths, weaknesses, opportunities and threats (SWOT - analysis)

3.2.1. Crop production

Agricultural areas in the municipality occupy 165,305 acres - 37.5 % of the total area and the forest 257,592 ha or 58.5 %. Land is managed entirely by private owners, as in the municipality operate two agricultural cooperatives. The largest shares in the structure of culture are potatoes, corn and cereals. Tobacco is a major industrial crop. There is a base for mechanical drying, which is a prerequisite for growing deciduous variety Virginia. Due to lack of markets in recent years such cultivation is suspended.

Other industrial crops – in village Banya started working workshop for distillation of essential oils (1999), but due to low prices of raw materials, interest in planting other crops, do not. Machine and Technology Park: outdated depreciated, high cost of services offered. Not enough mainly collecting technique: mowers, balers, potato lifting and plant protection machinery.

Table 5. Sowing (yield) area of agricultural crops for Razlog Municipality in hectares[1].

Crops	**1996**	**1997**	**1998**	**1999**	**2000**
Wheat	363.0	280.0	262.0	148.0	250.0
Barley	30.0	-	-	-	-
Maize (Zea mays)	281.5	700.0	900.0	800.0	700.0
Beans	76.2	101.1	201.5	180.6	151.0
Tobacco	81.9	310.4	251.1	150.6	90.0
Tomato	57.7	80.3	80.3	95.5	70.5
Green peppers	42.2	60.2	70.0	80.0	70.5
Onion	15.2	20.2	20.6	25.1	15.0
Potato	303.3	1017.7	1209.8	931.2	700.0
Apple	-	-	-	-	-
Peach	-	-	-	-	-
Grape - vine	11.6	11.6	11.6	11.6	11.6
Grape	-	-	-	-	-

Analysis of the data shows that the Municipality of Razlog operates from extensive farming type, characterized crop cultivation and livestock primarily to meet the needs within households. There is a very low growth rate of investment in the agricultural sector, a high degree of fragmentation of farmland, uncertain markets for selling their produce. Soil and climatic conditions in the municipality are suitable for growing tobacco, potatoes, some autumn cereals and fruit. Base dimensions overlapped during those four years are relatively unchanged. As of December 2005 the property in agriculture and forests are 85 registered agricultural producers, with no agricultural cooperatives.

[1] *Source: Regional Statistical Office - Blagoevgrad*

3.2.2. Analysis of the strengths, weaknesses, opportunities and threats.

STRENGTHS	**WEAKNESSES**
• Absence of industrial pollution, ecologically pure area; • Developed wood processing industry; • Water resources and power generation; • Availability of significant woodland and forest resources; • Traditional experience in agriculture.	• Fragmentation of agricultural land and insufficient opportunities for their consolidation; • Availability of large areas affected to varying degrees by erosion; • Remoteness of the municipality of economic and administrative centers.
OPPORTUNITIES	**THREATS**
• Ability to develop alternative forms of agriculture, rural and ecological tourism; • Traditional tourism; • Opportunities to attract inward investments and the activation of economic links with the business in Greece.	• Total economic decline; • Quality deterioration of the technical infrastructure; • Road and village infrastructures deformations

CONCLUSION

The main task of regionalization of crops, starting from the soil, climatic and economic conditions of a particular area is agricultural crops so be regionalized, to produce the highest yields and highest productivity at minimum cost per unit for each farm or ranch.

Family farms are closed; the land is cultivated almost without the use of equipment not carried out agricultural activities, leading to lower yields.

The marketing of agricultural produce is very difficult, and the proposed prices are below the cost of production. An exception is the implementation of the tobacco, where despite the possibility of delayed payments to producers purchasing campaign is at a satisfactory level.

There is no modern agricultural technology and modern buildings, and financial resources for technological innovation farm. Lack knowledge of proper implementation of agro technical measures, incorporation of fertilizers and pesticides is done randomly.

Family farms are not market-oriented, market appear surplus households. The production quality is low due to lack of knowledge among farmers about feeding and housing of animals.

The above problems mark negative trend of decreasing arable land, degradation of technical support agriculture and reduce yields. In animal husbandry, tends to reduce the numbers of animals continued deterioration breed and yields. Razlog municipality is included in the project "Sustainable Rural Development ", funded by UNDP and the Ministry of Agriculture and Food, in which it appears expert and financial support to farmers. Prospects for the development of agriculture in the municipality Razlog associated with introducing alternative crops such as herbs, raspberries and blueberries. Important for the development of agriculture is the development of related industries, especially the food industry and rural tourism. Opportunities for economic development are related to:

Lack of significant pollution of the environment and the ability to produce ecologically clean agricultural products, subject to the technological requirements;

The development of short-term programs for rural and eco-tourism based on the resources of the Rila National Park and Resort „Treshtenik”.

Active marketing investment to attract private investment in agriculture and industry with significant growth potential;

Opportunities for mining of wild mushrooms and herbs, as well as cultivation of medicinal plants as an alternative form of employment and reduction of unemployment for unemployed and for a significant proportion of growers.

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