2011
1st AC
TURKEY

**1st National Agriculture Congress and Exposition on behalf of Ali Numan Kıraç with International Participation**
April 27-30, 2011

# PASTURE UTILIZATION IN THE EAST PLANNING REGION IN REPUBLIC OF MACEDONIA AND THE NECESSITY FOR DETERMINATION OF THEIR GRASS COMPOSITION

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## ABSTRACT

East Planning region is established by the Low of Equal Regional Development. It is composed of 11 municipalities and spreads over 3537 km$^2$. There are 217 populated areas out of which 209 are characterized as rural settlements. According to the data by PE of Pasture management gross area under pastures in this Planning region is at level of 86,050 ha, on which 167,958 animals are grazing. Of this figure 25,415 (15,14%) are cattle and 142,513 (84,86%) sheep and goats. Based upon data by National Bureau of Statistics, pasture utilization by cattle is 0.29 animals per ha, and 1.65 heads per ha of sheep and goats. The Rule book on Organic animal husbandry determines the highest allowed number of animals per ha and that number is 2 and 13,3 heads per ha of cattle and sheep and goat respectively. Hence the conclusion on the possibilities of achieving sustainable development in Organic animal husbandry without jeopardizing current pastures conditions. Despite general conclusion the conditions at municipality lever differs significantly as in municipalities of Karbintzi, Cheshinovo-Obleshevo and Zrnovtzi pasture utilization is above determined level. Having no official records on pastures' grass composition if uncontrolled grazing comes into place, possible violation of bio balance could occur which could lead to loss of sustainable development of animal husbandry, vegetation loss and other pasture degradation process (erosion, soil loss, emergence of unspecific vegetation). In order to prevent region's biodiversity loss it is imminent to conduct determination of pasture's grass composition which will lead to determination of species, pasture capacity and grass energy value.

**Key Words:** pastures, biodiversity, grass composition determination

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## INTRODUCTION

In process of decentralization has been initiated in 2007 by which the former structure of central and local governance suffered significant changes. (Law on Equal Regional development, Official gazette of R.M 63/2007; State Statistical Office, 2008)).

According to NUTS III Republic of Macedonia is divided in 8 units (figure 1) with Governmental act for establishing nomenclature of statistical territorial units (State Statistical Office, 2008). One of them is the East Planning Region establish in 2008 composed of 11 municipalities (Berovo, Vinitza, Delchevo, Zrnovtzi, Karbintzi, Kochani, Makedonska Kamenitza, Pehchevo, Probishtip, Cheshinovo-Obleshevo and Shtip). According to the level of urbanization there are 217 settlements out of which 209 are characterized as rural (Mitrev et al., 2010; Council for Development of East Planning Region, 2009).

In order to achieve targeted level of development a Program for Development of East Planning Region has been designed. In that Program special emphasis is given to the Development of agriculture and animal husbandry (Council for Development of East Planning Region, 2009).


**Figure 1. Territorial division of the Republic of Macedonia**

Based on landscape characteristics this Region can be divided into two sub-regions: alpine and plane (Mitrev et al., 2010). The alpine area is spread over the area of Maleshevo and Pijanetz whit the municipalities of Berovo, Pehchevo and Delchevo. Main characteristics of this area are pastures on higher elevation on which during summer period animals of various types are grazing. On the other hand the lower part of this area is mostly planted with arable crops mainly wheat, oats and rye, mainly used for animal feed. Beside this type of production the area is rich with substantial plots with meadows usual used for cutting hay used for animal nutrition during winter period. Unfortunately the facilities in which the animals are kept are of old type usual divided in two parts. The lower part is used for keeping the animals and upper part is used for hay storage. As far as the farm type is concerned the dominant one are the sheep and cattle farms whose main product is sheep cheese and dairy products. Cattle farms in the sub-mountain areas raise the animals by free grazing system i.e. leaving animals to graze without human attendance on natural pastures.

The second sub-region of this Region is the plane one consisted of municipalities of Vinitza, Kochani, Zrnovtzi, Cheshinovo-Obleshevo, Probishtip, Karbintzi and Shtip. Although the term plane suggests open space without any hills the situation is a bit different. There are high mountain massive as are Osogovo on north and Plachkovica on south and between these massive is located Kochansko Pole while on north of Shtip towards Povardarie Region there is Ovche Pole area. Finally on south to the South-East Planning Region there is the valley of the river Lakavitza. The mountains part of these sub-region has numerous area under pastures suitable for animal grazing of any kind. The lower part has an in-built irrigation system offering possibilities for production of various crops.

The agricultural production in Macedonian society is of great traditional value. From the number of settlement of rural type can be concluded that the agriculture and animal husbandry play significant role in providing sustainable livelihoods for rural families. Almost every family in every village has at least 2ha of land and some animals, as presented in table 1. (State Statistical Office, 2009,).

**Table 1. Number of animals by specie – in thousands (State Statistical Office, 2009)**

| | 1998 | 2008 | 2008 |
|---|---|---|---|
| Cattle | 267 | 259 | 253 |
| Sheep | 1.315 | 1.234 | 817 |
| Pigs | 197 | 196 | 247 |
| Poultry | 3.339 | 2.901 | 2.226 |

Pasture management in the Republic of Macedonia is under the jurisdiction of Public Enterprise (PE) for pastures which is a part of Ministry of Agriculture, Forestry and Water Economy (MAFWE). This PE has an obligation to prepare annual plans for pasture management throughout the country. Unfortunately the situation is far from perfect, since in the last few decades there have been no activities related to pasture utilization, renovation of water resources and pasture cleaning of undesirable vegetation (PE for pastures, 2010).

Macedonia has 738.000 ha under pastures out of which 691.000 are of natural origin and the rest of 47.000 ha are artificial meadows. The amount of fresh animal feed produced from the pastures in the lowlands is estimated from 5.000-20.000 kg/ha annually, as compared to the pastured from the hill areas which produce 3.000-6.000 kg/ha fresh animal feed. Finally alpine pastures provide 1.500-4.000 kg/ha per year fresh animal feed (Ruby, 1997).

The Law of Organic Agriculture clearly determines the number of animals that can be released on certain pastures for the grazing purposes. Maximum 13 heads of sheep and goat, i.e. 2,5 heifers/2 cows per ha respectively are allowed to graze on organic pastures.

Looking through the official records of the number of animals by municipalities in the East Planning Region (Mitrev et al., 2010) and available area under pastures it is possible to determine the number of animals per ha. The indicator of current pasture utilization is represented by comparing the maximum allowed number of animals per ha with the number of animals per unit. It is to be emphasized that over 90% of cattle are kept indoors i.e. are not grazing on pastures. Hence the index that represents the value of cattle and heifers in this research is an average value of the maximum allowed number of animals to be grazing by the principles of organic agriculture.

## RESULTS AND DISCUSSION

Full area of the East Planning Region is 3.537 $km^2$, out of which 86.050 ha are under pastures. Number of animals grown in this region is 167.958 out of which 25.445 are cattle, and the rest of

142.513 are small ruminants (Mitrev et al., 2010; Council for Development of East Planning Region, 2009; State Statistical Office, 2008), as pointed in Table 2.

**Table 2.Municipality area ($km^2$) and area under pastures (ha) of the municipalities in the East Planning region (Mitrev et al., 2010; PE for pastures, 2010)**

| | Municipality | Area ($km^2$) | Pastures (ha) |
|---|---|---|---|
| 1 | Berovo | 598 | 14.924 |
| 2 | Vinitza | 433 | 10.306 |
| 3 | Delchevo | 422 | 7.123 |
| 4 | Zrnovtzi | 56 | 85 |
| 5 | Karbintzi | 229 | 38 |
| 6 | Kochani | 360 | 13.368 |
| 7 | MakedonskaKamenitza | 190 | 26 |
| 8 | Pehchevo | 208 | 2.602 |
| 9 | Probishtip | 326 | 15.359 |
| 10 | Cheshinovo-Obleshevo | 132 | 14 |
| 11 | Shtip | 583 | 22.205 |
| | **Total** | **3.537** | **86.050** |

Values of the number of animal grazing on the territory of the East Planning Region are presented in the figure 3. Numbers are starting point to obtain knowledge on temporal use of the pastures of every of the municipalities and can serve as a base for calculation for possible increase of the number of animals in every single municipality as presented in table 3.

**Table 3. Number of animals per municipality in the East Planning Region (State Statistical Office 2008, Mitrev et al., 2010)**

| | Municipality | Cattle | Sheep | Goat |
|---|---|---|---|---|
| 1 | Berovo | 2.290 | 26.226 | 3.379 |
| 2 | Vinitza | 2.032 | 9.255 | 6.494 |
| 3 | Delchevo | 3.672 | 8.558 | 6.684 |
| 4 | Zrnovtzi | 580 | 1.385 | 826 |
| 5 | Karbintzi | 3.971 | 13.506 | 2.688 |
| 6 | Kochani | 2.318 | 6.664 | 4.426 |
| 7 | MakedonskaKamentitza | 1.745 | 4.067 | 3.208 |
| 8 | Pehchevo | 1.839 | 10.647 | 926 |
| 9 | Probishtip | 2.443 | 15.180 | 2.653 |
| 10 | Chesinovo- Obleshevo | 2.117 | 10.385 | 1.237 |
| 11 | Shtip | 2.438 | 31.283 | 2.441 |
| | **Total** | 25.445 | 110.930 | 31.583 |

There are 14.924 ha under pastures and 31.895 animals in Berovo municipality out of which 2.290 are cattle, and the remaining 29.605 are sheep and goat or 0,15 cattle per ha, or 1,76 sheep per ha and 0,23 goat per ha. These values compared with the maximum allowed number of animals per ha (2

cattle and 13, 3 for sheep and goat per ha), indicate that this municipality has a potential for increasing the number of animals.

Similar is the situation in the municipality of Delchevo as well. The full area under pastures of 7.123 ha provides grazing conditions for 18.914 animals: 3.672 cattle (0,51per ha), 8.558 sheep (1,2 per ha)and 6.684 goat (0,94 per ha). The number of goats in this municipality is by far the largest in the region. Similar to the previous example Delchevo has same opportunities to increase the number of animals grazing in its limits.

Municipality of Vinitza has 10.306 ha under pastures. Table 2 indicates that there are 17.781 animal, 2.032 cattle and 15.749 sheep and goat, or 0,2 cattle per ha, or 0,9 sheep per ha and 0,63 goat per ha. This is another municipality where increasing the number of animals is possible without breaking the maximum allowed number.

The tables 2 presents that on the pastures in the municipality of Probishtip which are 15.359 ha are grown 20.276 animals. Of this number 2.443 are cattle and the rest of 17.833 are sheep and goat. With respect to pasture utilization the value on cattle is 0,16 per ha, 0,99 sheep and0,63 goat per ha.

Shtip municipality has largest area under pastures as compared to the rest of the municipalities 22.205 ha. Consequently this municipality holds largest number of animals (36,132) i.e. 2.438 cattle, and the rest of 33.727 sheep and goat. No matter this municipality holds the largest number of animals still pasture utilization does not overwhelm maximum allowed number of animals per ha.

In the table 2, data on Kochani municipality point that there are 13.368 ha and 13.408 animals.Under cattle there are 2.318 animals and 11.090 sheep and goat. Similarly to the Shtipmunicipality the number of animals can sustain larger amount without jeopardizing biodiversity.

Pehchevo municipality has same condition as already pointed with the other municipalities i.e. there are 2.2602 ha under pastures. The number of the animal's reaches 13.412, 1.839 cattle and 11.573 sheep and goat. With respect to pasture utilization the value on cattle is 0,7 per ha, 4,1 sheep and 0,36 goats per ha.

The following three municipalities: Karbintzi, Cheshinovo-Obleshevo and Zrnovtzi, possess smallest amount of pastures- 38, 14 and 85 ha respectively. Karbintzi municipality numbers 20.165 animals (2.117 cattle and 11.622 sheep and goat). In Cheshinovo-Obleshevo there are 13.739 animals (2.117 cattle and 11.622 sheep and goat). Finally Zrnovtzi municipality has only 2.791 animals (850 cattle, 2.211 sheep and goat). The amount of pasture availability and the number of animals kept in the households in the related municipalities point out to the significant danger of losing biodiversity.

The preview clearly shows that the pasture use by municipalities in the East Planning Region differs from one to another. Generally it can be concluded that the pasture utilization is at levels as follow: 0,3 cattle/ha, 1,29 sheep/ha and 0,37 goat/ha which suggests that the number of animals are within the limits of the maximal allowed number of animals per ha.

Data on pasture use for the municipalities of: Karbintzi, Cheshinovo-Obleshevo and Zrnovtzi for sure makes confusion which is due to the absence of data on animals' breeding condition. Namely SSO does not keep separate records regarding animals' housing.

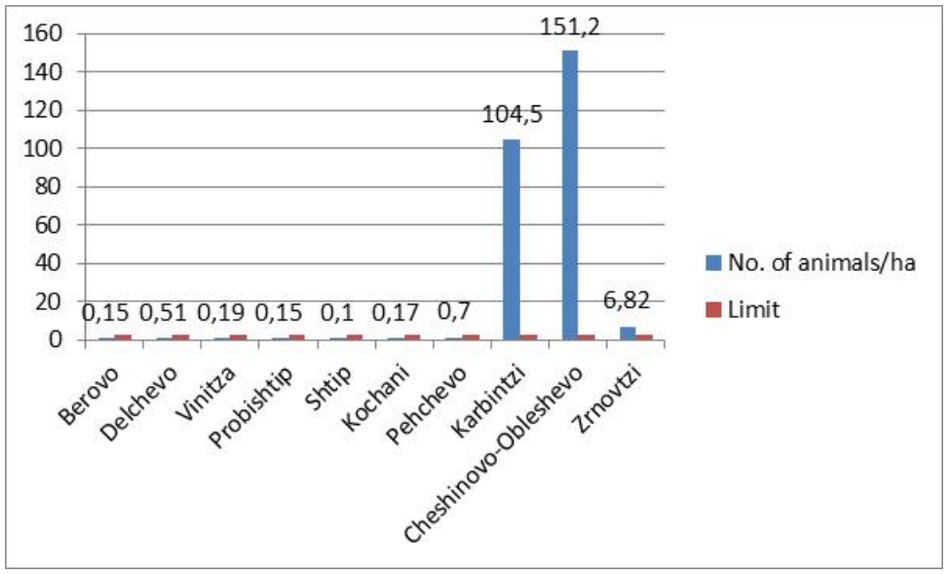


**Figure 2. Rate of utilization of the pastures in the East Planning Region by cattle**

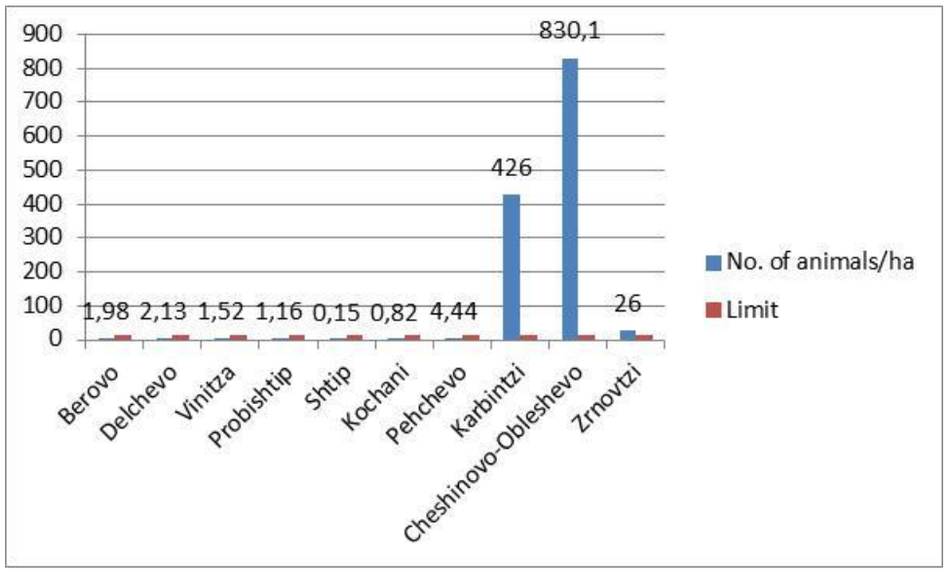


**Figure 3. Rate of utilization of the pastures in the East Planning Region by sheep and goats**

Figures 2 and 3 clearly identify the municipalities in which the number of animals' per ha goes over the limit over the maximum allowed. In these municipalities a special set of activities is imminent to be imposed in order to avoid possible biodiversity and pasture's destruction.

The threat of possible endangerment of the existing biodiversity could become real, identified through the presence of the maximum allowed number of animals per ha. In some municipalities the number of animals per ha is already above the limit and in part of them is rapidly closing. The municipalities which have already gone above the limit are: Karbintzi, Cheshinovo-Obleshevo and Zrnovtzi (Figure 4).


**Figure 4. Municipalities which have gone over the limit of maximum allowed number of animals/ha**

Having a case in which there has been no undertaken procedure for determination of the grass composition there are visible signs of disturbance of the limits between the pastures and the forests.The situation worsens further by uncontrolled grazing and in order to avoid further loss of bio balance a set of activities are necessary to be implemented, such are:

- persistence of current status
- improvement of pastures' conditions
- achieving sustainable development of animal husbandry in this Planning Region.

Grass determination is possible to be done through several methodologies. Up to this moment in Republic of Macedonia most frequent method is by classical method of microscoping. Week sides of this method are: long duration of procedure and subjectivity of the person that performs the determination. These week sides can be avoided through the use of contemporary method as is PCR (Polymerase Chain Reaction). Although data of grass composition is out dated, previous research activities identify many plant species growing on the pasture as presented in table 4 (Ruby, 1997).

**Table 4. Most frequent plants on Macedonian pastures (Ruby, 1997)**

| Grases | Forages | Other beneficial plants | Plants to be avoided |
|---|---|---|---|
| Agropyron repens | Trifolium repens | Amaranthus retroflexus | Ambrosia artemisifolia |
| Poa trivialis | Trifolium pratense | Daucus sp. | Sonchus arvensis |
| Avena fatua | Vicia sativa | Cirsium arvense | Capsella bursa-pastoris |
| Cynodon dactylon | | Taraxacum officinale | Solanum nigrum |
| Echinochola crus galli | | Chenopodium album | Euphorbia sp. |
| Apera spica-venti | | Pelargonium graveolens | Polypodium vulgare |
| | | Convolvulus arvensis | Urtica sp. |
| | | Rumex acetosella | Mentha piperita |
| | | | Papaver rhoeas |

## CONCLUSION

Having in mind was has been stated in the main text it is easy to be concluded that the full set of pre-conditions for identification of measures and activities that need to be undertaken are set in order to achieve biological balance and providing optimal conditions for economic development of local municipalities.

Based on the proposed optimal conditions for determination of pastures status presens will be made, action plans would be designed and to imply full set of agriculture techniques in order to provide conditions for unlimited movement, feeding and animals welfare on the pastures.

The following activities need to be undertaken:

- making an action plan to sustain and improve current pastures status
- determination of grass composition
- determination of grass' energy value
- pasture cleaning, fertilizing and other activities
- building up summer facilities and water resources.

## REFERENCES


Council for Development of East Planning Region, 2009

Ellis Ruby 1997 "Pastures" Land O' Lakes Inc. Macedonia

Law on Equal Regional development, Official gazette. of R.M 63/2007, pp.2-9

Mitrev et al., 2010, "Study for sustainable development of organic agriculture in the East Planning Region, Goce Delchev in Shtip", pp.168,

Ministry of Agriculture, Forestry and Water Economy 2009, Annual Report

PE for Pastures, 2010

State Statistical Office 2008, Census in Agriculture 2007 http://www.stat.gov.mk/pxweb2007bazi/Database/%D0%A1%D1%82%D0%B0%D1%82%D0%B8%D1%81%D1%82%D0%B8%D0%BA%D0%B0%20%D0%BF%D0%BE%20%D1%80%D0%B5%D0%B3%D0%B8%D0%BE%D0%BD%D0%B8/databasetree.asp

State Statistical Office, 2008, Nomenclature on Territorial Units for Statistics, pp.8

State Statistical Office, 2009, Macedonia in numbers 2009, pp.30.