RECULTIVATION AND REVITALIZATION OF KARST'S REGIONS WITH SHEEP AND GOATS AS A TOOL

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ABSTRACT
The main goal of our project is to revitalize abandoned karstic regions on the principles of silvopastoral systems based on traditional husbandry of goats and sheep and by causing minimal disturbances to the nature. Results of our two year experiment show positive effects on land cleaning and quantity and quality of the turf. However, restriction of animals to a fenced area, where the feed is of a lesser quality also has negative effects on the animals.

KEYWORDS
Karst, revitalisation, recultivation, silvopastoral system, small ruminants, health

INTRODUCTION
In the past 50 years about 300.000 hectares of former pastures and arable land in Karst's regions in Slovenia were overgrown with bushes and small trees, and the balance between agricultural and forest land was lost. One of the reasons for such situation was a sharp decline in number of small ruminants which took place during this period. The main goal of our project is to revitalize and recultivate Karst region by introducing a silvopastoral system (Auclair, 1995). By controlled grazing of small ruminants, which serve as a tool for land cultivation, we can control natural vegetation, clean the land, improve the quality of the turf (Bergez and Msika, 1995; Pogacnik et al., 1995), and produce meat, milk and wool at the same time (El Aich et al., 1991; Kompan et al., 1995). In this paper we are presenting some of the results obtained during the two year experiment and associated health problems encountered so far.

MATERIAL AND METHODS
We used breeds of sheep and goats adapted to the local conditions - the autochtonous breed Istrian tuft-wool sheep and various cross-breds of sheep and goats of a "milky" type. In the first year of the experiment the animals were divided in the experimental group and in the control. In the second year we formed three groups: two experimental and the control group. All the sheep were born in the last season. Some goats were adult and some born in the last season. Each year, the experiment lasted only through the grazing period. Animals in the experimental groups were grazing on the restricted area surrounded by electric fence (pasture No II, pasture No III), divided into smaller areas, and the animals were moved from one plot to another every 7 to 10 days. Animals on pasture No III were kept on this area for three weeks only, together with 250 other sheep and were then rejoined with the maternal flock grazing in a traditional way. Control animals were included in the maternal flock from the very beginning. With the number of animals used in the first year the load of pasture No II was 10 animal units per hectare (40 young animals weighting about 30 kg corresponds to approximately 30 adult animals per hectare). In the second year the turf on pasture No II was improved considerably so, the grazing of 30 sheep and 7 goats represented the load of 12 animal units per hectare. Total number of animals, grazing on pasture No III in the second year of the experiment represents the load of 22 animal units per hectare. We were primarily interested in the speed and the effectiveness of cleaning of the land with sheep alone and in combination with goats, that is "work" performed by the animals but also to the body weight increase. In the first year, the animals were weighted four times and in the second year three times. At the beginning and at the end of the each year experiment, we clinically examined the animals, took the blood samples and examined feces for parasites. Necropsy was performed on all dead animals.
Results and Discussion

The basic rationale for the project of recultivation and revitalization of Karst by using small ruminants is to upgrade the existing traditional farming systems in the region, instead of introducing a completely new and different farming system. Our prime interest is to improve the land in the best possible natural way, with minimal additional measures and expenses. For this purpose, several experiments are in progress and here we present only a small part of those. These experiments include: testing of various load of the terrain with sheep and goats, the effects of different proportion between sheep and goats, the effect of fertilization and intersowing of various plant species, studies on the suitability for such type of sustainable farming of the autochtonous breeds, and many other aspects.

Apart from positive results obtained with this type of animal husbandry we also observed some negative effects, of which slower growth rate was the most obvious. According to our results of the two year experiment, the total increase in body weight of the animals grazing in a traditional way was 20 % higher in the first year (Table 1) and 10 % higher in the second year (Table 2), compared to experimental animals. It should be noted, however, that all animals gained less weight in the second year. In both years, we have noticed that lambs with low initial body weight grew with a different rhythm and gained more weight than animals with higher initial weight. The "work" that animals performed - like cleaning the terrain, was monitored also by changes in quantity and botanical composition of the turf. On pasture No III low quality grasses occupied the largest proportion of vegetation - 70%, legumes only 1.5% and herbs 28.5%, similar as on pasture No II at the beginning of recultivation. After first year of the experiment the most obvious was the change in density of the turf with several quality grasses (54%) and increased proportion of legumes (14%) and herbs (32%). Despite the low quality food on pasture No III, the animals in this group exhibited the highest growth rate. This can be explained by the fact that animals in this group had the lowest initial body weight, stayed on that pasture for only 21 days - just long enough to consume the low quality vegetation - and were then joined to the basic flock where they could graze selectively. Compared to control group, these animals were less active during the initial period and were less prone to parasitic infections, due to less contaminated surfaces.

In both years of the experiment we have lost only one animal, struck by lightening, whereas 45 animals died in the maternal flock, most of them in the lambing period. The most frequent causes of death were associated with infections of various organs, mostly respiratory, and with parasites. Dehelmentization is usually performed in spring, before the animals leave for grazing and then repeated in autumn before they return to the winter stable. So far, this practice was relatively efficient and successfully controlled parasitic infections in animals grazing in a traditional way. In the second year, we have

diagnosed heavy parasitic infections in late summer (Dicrocoelium dendriticum and intestinal parasites), despite the spring treatment, attributed primarily to a wet summer that provided favorable conditions for the development of parasites, especially on pasture No II which has been used as a pasture in the previous season. Such situation required changes of the existing program of dehelmintization with additional tretments.

CONCLUSIONS

After two years of the experiment we can already observe the effects of animal work on the experimental pastures. This work is manifested in clearness of the terrain and visible improvement of the quality and quantity of the turf. Provided that parasitic infections are successfully controlled, small ruminants are effective tools for recultivation and further exploitation of abandoned land. Our results for the second year indicate that the difference in growth rate between the experimental and control animals is likely to diminish in the following years, due to improved quality of the turf with higher proportion of quality herbs. Our future research will be focused on determination of the optimum relationship between the number of animals per hectare of pasture and the length of the grazing period, determination of the optimum ratio between sheep and goats, improvement of health programs according to conditions prevailing on the pasture. Finally the economic evaluation of positive and negative effects of the controlled grazing will be prepared and the optimum strategy for maximum benefits with minimal possible losses determined.

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Table 1

First year of the experiment. Experimental and control group. Mean body mass (kg±SD) of sheep at the beginning (Initial body mass), during the experiment (Intermediate body mass I, Intermediate body mass II) and at the end of the experiment (Final body mass); daily growth rate (g/sheep/day) and total growth rate (in kg and %) during the experiment.

Sheep (all breeds)	Date of weighting	Pasture No II n=40	Control n=10
Initial body mass	31.5.94	30.3±3.5	24.9±3.5
Intermediate body mass I	1.7.94	33.2±3.6	28.9±3.1
Intermediate body mass II	28.7.94	35.5±3.3	33.0±3.3
Final body mass	29.8.94	37.4±3.5	35.3±3.4
Daily growth rate (g/sheep/day)		88.0	116.0
Total growth rate in kg		7.1	10.4
Total growth rate in %		23.4	41.8

Table 2

Second year of the experiment. Experimental and control group. Mean body mass (kg±SD) of sheep at the beginning (Initial body mass), during the experiment (Intermediate body mass) and at the end of the experiment (Final body mass); daily growth rate (g/sheep/day) and total growth rate (in kg and %) during the experiment.

Sheep (all breeds)	Date of weighting	Pasture No II n=30	Pasture No III n=12	Control n=15
Initial body mass	20.6.95	33.1±4.3	25.7±6.9	32.1±6.2
Intermediate body mass	8.8.95	37.5±4.8	29.4±5.9	35.4±6.0
Final body mass	4.9.95	34.0±4.2	32.5±6.0	35.6±4.9
Daily growth rate (g/sheep/day)		35.0	95.7	49.0
Total growth rate (kg)		0.9	6.8	3.5
Total growth rate in %		2.7	26.5	10.9