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Dependence of the conservation status of acid grasslands at the Pohorje and Kozjak on socioeconomic parameters

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ABSTRACT

Grassland habitats were studied on twenty farms on the area of the Radlje ob Dravi administration unit, in the transect from Kozjak to Pohorje at different altitudes. The aim of the study was to investigate how environmental and socio-economic parameters influence the diversity of plant species and, consequently, the conservation of grassland on acid soils, which are rare in Slovenia and are therefore more protected. The socioeconomic structure of farms was studied on the basis of an inquiry carried out on farms. Part-time farms prevail; the average age of farmers is 56.5 years, and 30% of farmers has no education or just elementary school. The relationship among the environmental, socio-economic parameters and floristic structures of grasslands was studied using canonic-correspondence analysis. The impact of 16 parameters was analysed, of which six were determined not to be statistically significant. The occurrence of chosen plant species was analysed in relation to environmental and socioeconomic parameters. The efficiency of agro-environmental subsidies in relation to plant species diversity was evaluated. It was determined that the education and age of farmers influence the intensity of farming and consequently have an impact on the diversity of plants species and the conservation status of grasslands.

Key words: grasslands, habitats, biotic diversity, plant species, socio-economic structure of farms, Kozjak, Pohorje, Slovenia

IZVLEČEK

ODVISNOST OHRANJENOSTI KISLIH TRAVIŠČ NA POHORJU IN KOZJAKU OD SOCIOEKONOMSKIH PARAMETROV

V nalogi proučujemo traviščne habitate na območju Upravne enote Radlje ob Dravi, na dvajsetih kmetijah, na območju Pohorja in Kozjaka in na različnih nadmorskih višinah. Namen naloge je bil proučiti ali socioekonomski dejavniki vplivajo na diverziteto rastlinskih vrst in posledično s tem na ohranjenost travišč, predvsem travišč na kisli podlagi, ki so redkejša in zato še posebej varovana. Na podlagi izvedbe anket na teh kmetijah smo proučili socioekonomsko strukturo kmetij. Prevladujejo mešane kmetije, povprečna starost gospodarjev je 56,5 let in kar 30 odstotkov gospodarjev je brez izobrazbe ali imajo končano osnovno šolo. Z metodo kanonične korespondenčne analize (CCA) smo poskušali ugotoviti, kateri ekološko- socioekonomski dejavniki so najbolj povezani z vrstno sestavo travišč. Določili smo šestnajst spremenljivk, pri čemer je bilo osem statistično neznačilnih. Proučili smo povezanost ekološko-socioekonomskih dejavnikov s pojavljanjem rastlinskih vrst. V raziskavi smo ovrednotili učinkovitost kmetijsko okoljskih plačil na raznolikost rastlinskih vrst. Ugotovili smo, da socioekonomska dejavnika izobrazba in starost gospodarjev kmetijskih gospodarstev vplivata na intenzivnost kmetovanja in posledično s tem na raznolikost rastlinskih vrst in ohranjenost travišč.

Ključne besede: travišča, habitati, biotska raznovrstnost, rastlinske vrste, socio-ekonomska struktura kmetij, Kozjak, Pohorje

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Prispevek je del magistrskega dela interdisciplinarnega podiplomskega študija Varstva okolja Univerze v Ljubljani: KETIŠ, Karmen. *Vpliv gospodarjenja s travišči na naravovarstveno vrednost teh habitatov v upravni enoti Radlje ob Dravi : magistrsko delo = Impact of the grasslands management on their natural protection value in the Radlje ob Dravi administrative unit : M. Sc. thesis*. ; mentor: prof. dr. Franc Batič, somentor: prof. dr. Andrej Udovč.

1 INTRODUCTION

Animal husbandry is the most significant agricultural discipline in Slovenia due to environmental circumstances, and grasslands represent the major part of agricultural land. The orientation toward animal husbandry is even narrower in comparison with crop production. One key factor in this is the size structure of farms, which is more suitable for labour- and income-intensive animal husbandry farms than for specialized crop production or mixed crop-animal husbandry production. The consequence of the inappropriate size structure of farms in Slovenia is also reflected in their socio-economic structure. Part-time farms prevail; farms are too small to enable income solely from agricultural activity. Due to these unfavourable conditions, small farms seek income in labour-intensive production activities, such as cattle rearing and milk production (Hrustel Majcen, 2005).

Problems in the area of agriculture and environment are connected with the abandonment of agriculture in marginal areas and with the intensification of activity in lowlands, soil degradation and erosion, eutrophication due to fertilisation and the use of pesticides in agro-ecosystems, regulation of water regime, irrigation and loss of buildings due to abandonment and decay (Pregled …, 2001).

Vrišer (2005) stresses that size structure of farms represents the most important factor of socio-economic basis in the agricultural economy. The type of agricultural activity depends largely on this parameter, which also determines the social role of agriculture. The inappropriate size structure of farms does not allow proper income, what is then often a source of discontent of poorer farmers as also a cause for their social activity.

The essential problem of Slovenian farms is their small size, which is additionally enhanced by the high level of fragmentation of areas in agricultural land use. The consequences of the unfavourable size structure of Slovenian farms are also reflected in their socio-economic structure (Cunder, 2002). As already stated, part-time farms prevail, because farm enterprises are too small to provide income solely from agricultural activity.

With an average size of 6.5 ha, Slovenia has some of the smallest average farm sizes in the world (Poročilo …, 2009).

Numerous areas, critical for habitat conservation and biotic diversity, are linked to agricultural land use areas. In the past agricultural land use caused the development of habitat types not existing in pristine nature (Zechmeister et al., 2003).

The fragmented structure of agricultural and forestry land use contributes to high biotic diversity, conservation of habitats and to high natural and landscape diversity. The fragmentation of units of land use types conserves a mosaic structure of the landscape in which semi-natural areas are interwoven with croplands. In natural areas of high value, it is necessary to conserve the fragmentation of units of land use by subsidies and thereby help farmers to equalise economic lost, caused by these structural circumstances (Program razvoja …, 2007).

Batič et al. (2002) emphasised that agricultural activity changes natural ecosystems and decreases biotic diversity but also creates new habitats and increases biotic diversity. The increase or decrease of biotic diversity is dependent on the type of agricultural activity, which depends on natural pedoclimatic circumstances and on socio-economic relations. In general, high intensity agriculture decreases biotic diversity while extensive agriculture increases biotic diversity. Intensive agricultural activity, linked to the chemicalisation of the environment and aspiration for higher yields turned out in several occasions to be unacceptable, but it simultaneously enabled the growth and spread of humanity on the Earth. Due to natural conditions, partly also with them linked agricultural praxes and socio-economic circumstances, the intensity of agriculture is generally low in Slovenia, with the exception of some lowlands and areas under intensive use, e.g. orchards and vineyards, in comparison to other developed countries of the European Union. This is reflected in several fields and in Slovenia's biotic diversity, which is quite high with regards to the small size of the country.

The abandonment of grassland use and encroachment with shrubs and pioneer forest, in progress for more than fifty years, is a consequence of soil impoverishment in nutrients and therefore lower productivity potential, expressed as lower productivity of grasslands and lower fodder quality. Connected to the impoverishment of soil fertility are changed socio-economic circumstances for living in such areas. In the structure of land use, cultivated agricultural lands comprise only 25% of all agricultural lands in Slovenia. The proportion of permanent grasslands in use comprises 60%; this has remained unchanged for last 50 years. In this time, many fields were transformed to meadows and pastures, and former pastures were transformed to shrublands and pioneer forest, which according to the land management law already belonged to the forest sector (Vidrih, 2007).

Zechmeister et al. (2003) and Strijker (2005) warned about inefficient, overly general agricultural-environmental measures that have been implemented in order to conserve grassland habitats from the state policies. Greater flexibility according to local natural and socio-economic circumstances should be necessary in taking and formulating these measures, in addition to other recommendations by Critchley et al. (2003) and Kleijn et al. (2001).

The role of agriculture in environment management has been drastically changed with technological development and socio-economic changes in that this discipline is evaluated as the major threat to global biodiversity and stability of ecosystems (Sala et al., 2001).

Areas significant for species and habitat conservation are linked to agricultural land use. Agriculture can positively or negatively influence conservation and the sustainable use of components of biotic diversity. Many investigations in this field, carried out throughout the world, show how direct activities in agriculture, such as fertilisation, mowing technologies, pasture regime, etc., influence grassland habitats. Several studies dealing with the evaluation of efficiency of agricultural-environmental measures give different conclusions. Critchley et al. (2003) in Great Britain, Paschlod et al. (2005) in Sweden, and Taylor & Morecroft (2008) in south England concluded that agro-environmental schemes contributed to the conservation of grassland species diversity. In contrast, Bakker & Heerdt (2005) concluded that agro-environmental measures in the Netherlands had no positive effect on the conservation of grasslands. There are fewer investigations dealing with the connection between nature conservation and socio-economic parameters. Some investigations of this kind were carried out by Zechmeister et al. (2003), Paschlod & WallisdeVries (2002) and Wytrzens & Mayer (1998). There are few similar studies for Slovenia; exceptions are that of Plajnšek (2005) for the district of Goričko, showing some correlation between the socio-economic characteristics of farms and conservation status of critical habitats for nature conservation and Žgavec et al. (2013) for the Radensko polje, which also pointed to certain unefficiency of implemented socio-economic measures on conservation status of grassland habitats.

Studies carried out in Germany revealed how changes in land-use type drastically decreased grassland habitats in limestone, sandstone and wet grasslands (Poschlod et al., 2005). The abolition of fertilizers in ecological farming in Netherlands decreased the productivity and fodder quality of pastures but increased their species diversity (Bakker & Heerdt, 2005). The effects of increased use frequency of grassland habitats and problems after the new decrease of their use in the 1963–2003 period are shown in the study of Hodgson et al. (2005).

There are many fewer holistic studies, which would include all factors influencing the condition of grassland habitats. According to Poschlod et al. (2005), the socio-economic factors are the most important. The linkages between nature conservation and socio-economic factors are highly complex, in the majority indirect, and therefore difficult to evaluate, but necessary and urgent for understanding the changes in the field, as emphasised by Poschlod et al. (2005). In this aspect, investigations of Zechmeister et al. (2003), Poschlod & Wallis deVries (2002) and Wytrens & Mayer (1998) are rare exceptions.

Grasslands on acid soils are very rare in Slovenia due to the prevailing limestone bedrock and

therefore are under special protection. Among such grasslands are those on the Pohorje and Kozjak mountain range. The nature conservation value of those habitats depends on type of land use, and their protection is not possible merely by administration acts but only with prescribed land use, in which the socio-economic parameters connected to farmers' populations plays a significant role.

In this study, we wanted to evaluate the connections among the size and socio-economic structure of farms, the educational and age structure of farm holders and the intensity of farming. We were also interested to what extent agro-environmental payments contribute to plant species diversity and conservation of habitat types and what the relationship between the floristic composition of grasslands and socio-economic parameters is.

2 MATERIAL AND METHODS

The study was carried out on farms chosen in the transect over the Drava valley, from Kozjak to Pohorje, within the Radlje ob Dravi administration unit. Productional orientation of farms is in the majority of farms in animal husbundry, fodder production and supplemented farming. Natural circumstances supporting agriculture enable cattle rearing for milk and meat and sheep and goat rearing. Position and exposition of grasslands supports both types of use, e.g. grazing and mowing. Whole area of the Radlje ob Dravi administration unit belongs to the areas in which natural circumstances limit agricultural activity (LFA areas), in which about 80% of farms belongs to mountainous and steep areas. Use of agricultural mechanisation is limited in these farms due to the high altitude, steepness of the terrain, remoteness of grasslands from main farm buildings.

According to agricultural census from 2010 (Popis, 2002; www.stat.si) were in the area 823 farms in total, from which 511 or 62% were specialized in animal husbandry. From this we selected twenty farms of different types, e.g. with intensive production, to extensive production to farms having already abandoned agricultural land. In the choice of farms, other parameters were also considered in order to include the entire variation of demographic and socio-economic circumstances to the greatest extent possible. With this choice, we obtained gradients of the factors that impact on state of grasslands.

The study was limited to grasslands. The first issue in the choice of farms was altitudinal position of farms on both banks of the River Drava. On the left bank, on the slopes of Kozjak, there were farms from the valley (ca. 300 m above sea level), on the first terrace above the river to 700 m of altitude. On the right bank, on the slopes of Pohorje, the transect of farms extended to 1000 m a.s.l. Data about farms were obtained by interviews on twenty farms chosen in the transect; characteristics of grasslands' floristic composition were obtained by mapping plants on grasslands (meadows, pastures) belonging to the analysed farms, before the first mowing in spring.

With inquiries among farm holders, in addition to environmental parameters (altitude, steepness, exposition and soil characteristics, also we analysed socio-economic and production characteristics of farms (ownership and size of farms, kind and manner of land use, history of land use, technology of grassland management (grazing, mowing, fertilisation, use of mechanisation, application of agro-environmental measures).

The inquiry was of a combined type with 49 questions, some with sub-questions.

The inquiry was carried out at the end of August 2009. Each interview lasted from one half hour to two hours; so one to four interviews were done per day. Data were analysed by methods of descriptive statistics and use of MS Excel; they are presented in graphs and tables.

Data on grassland mapping were processed by CCA statistical analysis. For elaboration of the figures, the programme CANOCO 4.5 for Windows was used (Braak and Šmilauer, 2002). The obtained results are presented in ordination graphs.

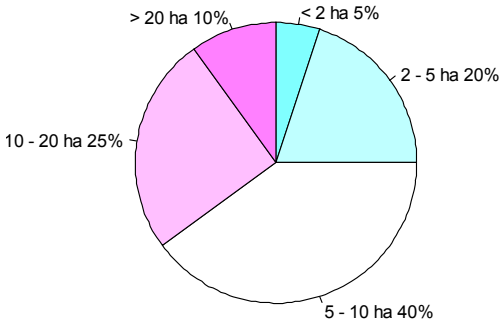
3 RESULTS AND DISCUSSION

3.1 Size structure of farms

Farmers cultivate their own land and hired land, some farms also rent their land out. In the area analysed, more than half of agricultural land is farmers' property (65%) but only 3% of land is hired. Land rented to other farmers was not detected.

Analysis of the size structure of agricultural lands showed that majority (40%) of the farms researched belonged to the medium size class, between 5 and 10 ha. The proportion of small farms (to 2 ha) is 5%. There is 10% of big farms (over 20 ha) in the analysed area (Fig 1). Sizes of the researched farms are comparable to average farm sizes in Slovenia, according to the state inquiry carried out in 2000 (5.3 ha), in which 75% of farms are slightly bigger than 5 ha (Popis.., 2002).

A total of 7% of farms are classified in montane belt, 5% to hilly and 5% to steep areas; only 15% of farms are not classified to areas considered less favourable for agriculture (LFA).



Slika 1: Delež anketiranih kmetij v letu 2009 po velikostnih razredih
Figure 1: The proportion of farms surveyed in 2009 by size classes

The biggest part of the researched farm lands is forest: 68% (450.7 ha). The majority cultivate their own land, and only a smaller portion of the land is hired. The proportion of meadows is 16% (106.4 ha); the proportion of fields, gardens and pastures is slightly above 14% (103.0 ha). Orchards comprise about 1% of the entire area (8.5 ha) (Table 1). Each farm still possesses a high stem orchard meadow, meaning that traditional land use still exists and that farmers are aware of it. Ninety per cent of these orchards are well tended, the remainder belonged to abandoned farms and were not tended. The majority of these orchards are used for supplying fruits to farmers; they are usually smaller than 10 acres and are classified as meadows. In the analysed area, there were no agricultural land rented to other people.

Preglednica 1: Zemljišča anketiranih kmetij in njihova raba v letu 2009
Table 1: Agricultural areas of the surveyed farms and their use in 2009

Land categories	Property (ha)	Hired (ha)	Rented (ha)	Together (ha)
Fields and gardens	22.4	39.3	0.0	61.7
Orchards	8.5	0.0	0.0	8.5
Meadows	94.9	11.5	0.0	106.4
Intensive pastures	0.0	0.0	0.0	0.0
Pastures	29.5	3.3	0.0	32.8
Forests	450.7	0.0	0.0	450.7
Together (ha)	**606.0**	**54.1**	**0.0**	**660.1**

Uncultivated land comprises 4.6 ha (slightly more than 2%). The reason for the lack of cultivation is inappropriate terrain for machinery or excessive distance from the farm.

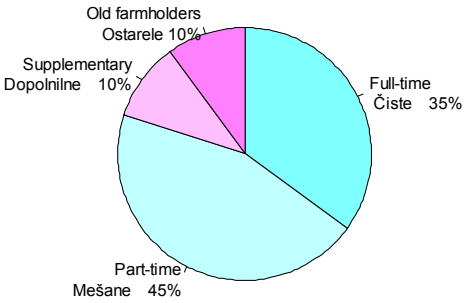
The farmers researched possess 7.8 ha of agricultural land on average. All cultivated their own land, on average 10.5 ha per farm. On average, the agricultural land of their farm consisted of seven pieces, (ranging from one to 19 pieces), mostly due to the configuration of the terrain.

3.2 Socio-economic characteristics if inquired farms

The socio-economic type of farm shows from which sources farms earn income, and also how much of the income is from agricultural activity (Kovačič, 1996).

Criteria for socioeconomic types of farms were taken from Udovč et al. (2006).

Part-time farms prevail among the researched farms (Fig. 2) and there are nine such farms, accounting for 45% of the total; seven farms are full-time, earning all income by farming, (35%), 20% of farms (two farms) are supplementary farms and two farms are with old farm holders.

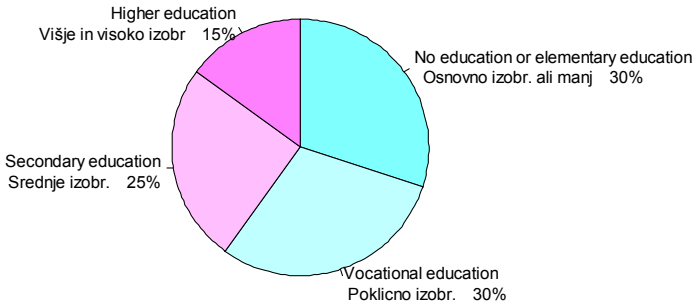


Slika 2: Socio-ekonomska struktura anketiranih kmetij v letu 2009
Figure 2: Socioeconomic structure of the surveyed farms in 2009

3.3 Educational and age structure of farm holders

A proper educational structure of farm holders has considerable impact on farm management due to a better adjustment to contemporary economic and environmental issues. Thirty per cent of farm holders have no education or just elementary school. The same percentage has vocational agricultural school or another vocational school. Twenty-five per cent of farm holders have degrees from agricultural college or another college. Higher agricultural school or other higher school accounts for 15% of farm holders (Fig. 3). The reason for the lower education level is the high proportion of older farm holders; their children have higher levels of education.

The age structure allows determination of human potential and possibilities for further development of farms.



Slika 3: Nivo dosežene izobrazbe gospodarjev na anketiranih kmetijah v letu 2009
Figure 3: Level of educational attainment of managers on the farms surveyed in 2009

Preglednica 2: Starost gospodarjev na anketiranih kmetijah v letu 2009
Table 2: Age structure of managers on the surveyed farms in 2009

	Farm holders age categories s (years)					Together
	under 35	3 –44	45–54	55–64	over 64	
N	1	3	7	2	7	20
%	5	15	35	10	35	100

3.4 Influence of eco-socio-economic factors on floristic composition of grasslands

With the method of canonic-correspondence analysis (CCA), we attempted to determine which of the environmental, or socio-economic factors has the best linkage with the floristic composition of grasslands. We analysed 16 impacting parameters, which were assumed to have greater impact on grasslands:

-Altitude (m) (Alt)
-Average inclination of grassland (%) (Incl)
-Exposition of grassland (%) (Eksp)
-Soil type (PKE) (Soil)
-Fertilisation (kg N/ha/year) (N)
-Grassland use (Use)
-Frequency of grassland use (Freq)
-Type of farm (FType)
-Number of LSU on farm (LSU)
-Age of farmholder (Age)
-Education of farmholder (EDU)
-Size of farm (Size)
-Remoteness (km) (Remot)
-Burden by LSU/ha (LSU)
-Grassland origin (Origin)
-Mineral fertilisers (kg/ha) (Min)

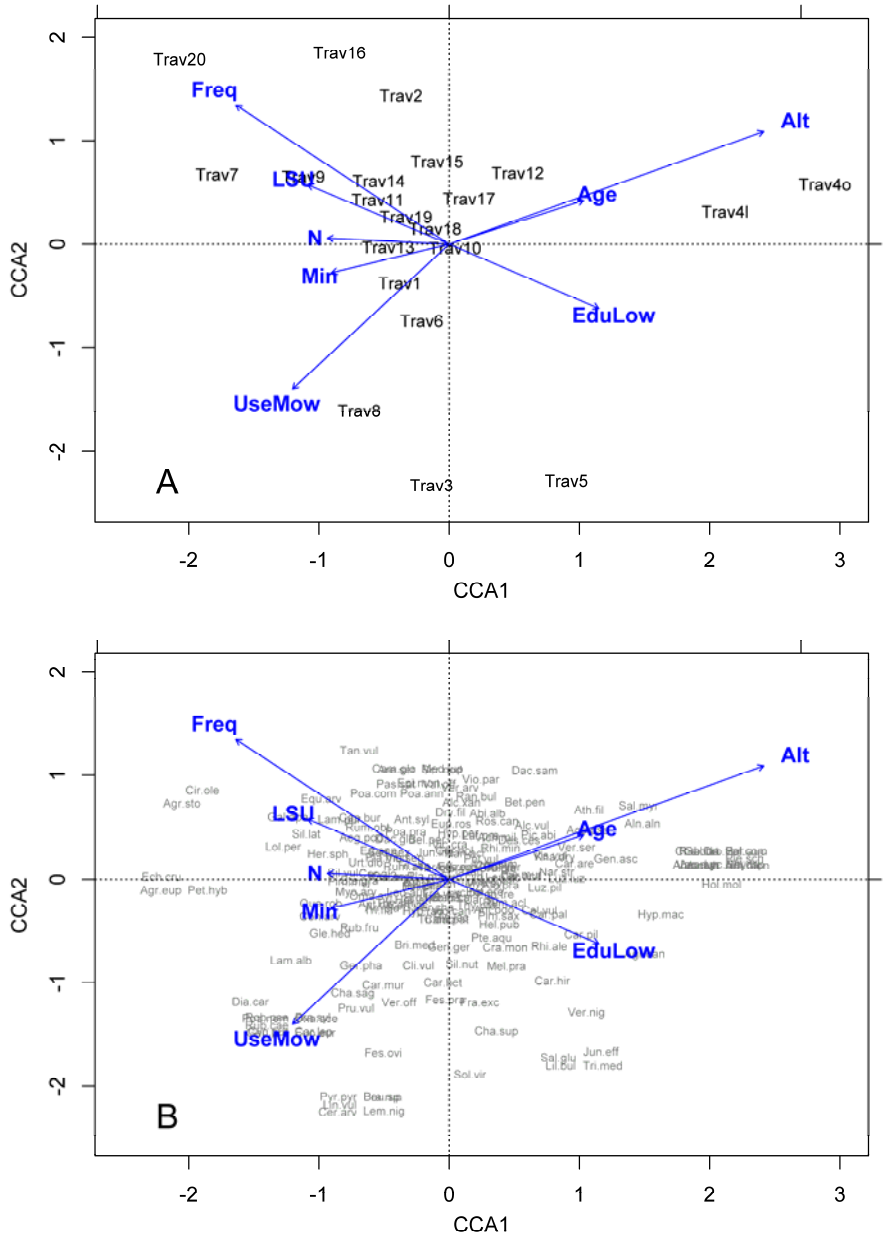
From all analysed parameters, the following eight had statistically insignificant impact:

-Average inclination of grassland (%) (Incl)
-Exposition of grassland (%) (Eksp)
-Soil type (PKE) (Soil)
-Type of farm (FType)
-Number of LSU on farm (LSU)
-Size of farm (Size)
-Remoteness (km) (Remot)
-Origin of grassland (Origin)

The results of CCA are presented in an ordination diagram in which the linkage between individual parameters with the floristic composition of grassland is presented with the length of the vector.

The characteristics of grasslands marked with T7, T9, T20 (Table 3) are: greater frequency of cutting (more than 3 times per year), bigger burden by LSU/ha, more fertilisation with N (kg N/ha /year), greater consumption of mineral fertilizers (kg/ha/year), higher education of farm holders, lower ages of farm holders and lower altitude. These grasslands are more intensively used, in contrast to grasslands marked T3, T5, T8, which are used more extensively. On the grasslands marked T40 and T4l, we conclude that following factors are responsible for the occurrence of endangered plants: higher altitude, lower education and higher age of farm holder, lower burden by LSU/ha, small input of organic fertilizers, (kg

N/ha/years), absence of mineral fertilizers, and combined grassland use (grazing and mowing).



Slika4: Ordinacijski diagram za prvi dve osi pri kanonični korespondenčni analizi. A – povezanost vegetacijske sestave travišč in okoljsko-socioekonomskih dejavnikov. B – povezanost pojavljanja rastlinskih vrst na obravnavanih traviščih in okoljsko-socioekonomskih dejavnikov.

Figure 4: Ordination diagram for the first two axes of the canonical correspondence analysis. A – relationship between species composition of investigated grasslands and the environmental-socioeconomic variables . B – relationship between the plant species occurence in the investigated grasslands and environmental-socioeconomic variables. The abbreviations for the variables used: UseMow – type of grassland use (mowing yes/no), Freq – frequency of grassland use, Min – mineral fertilizers added or not, N – quantity of nitrogen fertilization, LSU – stocking rate, Alt – altitude, Age – farmholder age, EduLow – Education of farmholder (lower than secondary school yes/no).

Fig. 4 shows the ordination in linkage between occurrence of certain species groups and impacting factors (environmental, socioeconomic). On grasslands that are used predominantly for mowing, marked by Use, the following species occur: *Veronica officinalis* (Ver. off), *Carex muricata* (Car. mur), *Geranium phaeum* (Ger. pha), *Rubus fruticosus* (Rub. fru), *Dianthus carthusianorum* (Dia. car) and *Carpinus betulus* (Car. bet).

On grasslands with more intensive use, i.e. more than three cuttings per year, marked by Freq1, the following species prevail: *Poa pratensis* (Poa. pra), *Vicia sepium* (Vic. sep), *Aegopodium podagraria* (Aeg. pod), *Rumex obtusifolius* (Rum. obt), *Heracleum sphondylium* (Her. sph) and *Equisetum arvense* (Equ. arv).

Species that appear on grasslands fertilised by mineral fertiliser (marked with Min) are: *Leontodon hispidus* (Leo. his), *Centaurea jacea* (Cen. jac), *Lamium album* (Lam. alb) and *Convolvulus arvensis* (Con. arv).

Fertilising with nitrogen (kg N/ha/year), marked by N, causes the appearance of *Rumex obtusifolius* (Rum. obt) and *Stellaria graminea* (Ste. gra).

A greater burden by LSU/ha, marked by LSU, influences the appearance of *Lolium perenne* (Lol. per), *Silene vulgaris* (Sil. vulg), *Rumex acetosa* (Rum. ace) and *Pimpinella major* (Pim. maj).

Higher education of farm holders, marked by Edu, influences the appearance of *Silene latifolia* (Sil. lat), *Lamium purpureum* (Lam. pur), *Capsella bursa-pastoris* (Cap. bur), *Knautia arvensis* (Kna. arv) and *Rumex acetosa* (Rum. ace).

With higher altitude, marked by Alt, the following species appear: *Luzula campestris* (Luz. cam), *Viscaria vulgaris* (Vis. vul), *Nardus stricta* (Nar. str), *Veronica serpyllifolia* (Ver. ser), *Acer pseudoplatanus* (Ace. pse) and *Salix myrsinifolia* (Sal. myr).

Higher age of farm holders, marked by Age, linked with higher altitude, marked Alt caused appearance of following species: *Euphrasia rostkoviana* (Eup. ras), *Rhinanthus minor* (Rhi. min), *Achillea millefolium* (Ach. mil), *Galium verum* (Gal. ver), *Ajuga reptans* (Aju. rep) and *Picea abies* (Pic. abi).

3.5 Number of plant species on analysed grasslands in relation to agro-environmental measures

Table 3 presents the number of agro-environmental measures claimed by the farmers on the analysed grasslands and demarcation of grasslands. Half of the farmers claim direct payment under the KOP scheme (Kmetijsko okoljski program – Agro-environmental program); 10% of farmers were also included in the SKOP scheme (Slovenski kmetijsko okoljski program – Slovenian agro-environmental program); 40% of farmers applied just for the basic agricultural measures. The total analysed grasslands had an area of 58.4 ha. For this area, all farmers claimed basic payments from the first pillar of subsidies and payments for the areas with limited conditions for agricultural production (LFA). Twenty per cent of farmers claimed the measure for ecological farming (EK), comprising 12.6 ha of agricultural lands The measure called "co-natural rearing of domestic animals" (REJ) was claimed by 40% of farmers (23.3 ha of agricultural land): 60% of farmers claimed just the measure of mowing of steep meadows (inclinations of 35–50%= (S35) on 21.0 ha of agricultural land and 45% of farmers used the measure for mowing steep meadows with inclination over 50% (S50) on 11.0 ha of agricultural land. Analysis of plant species on the studied grasslands showed that on a quarter of analysed grasslands, fewer than 50 plant species were found (27 to 49). For these grasslands, farmers claim just the basic measures. Within these basic measures, were also grasslands (1%) on which we found from 60 to 70 plant species. On the rest of grasslands, where farmers also claim measures from KOP and SKOP, we found from 51 to 78 plant species.

Preglednica 3: Število vrst na proučevanih traviščih ter vrste ukrepov za proučevana travišča
Table 3: Number of species in the surveyed grasslands and the types of measures for surveying the grasslands

Demarcation of grasslands	Number of plant species	Kinds of measures on analysed grasslands
Trav1	62	KRM, OMD, UP, EK, S35 (271 ar), S50 (128 ar)
Trav2	57	KRM, OMD, UP, EK, S35 (88 ar) , S50 (54 ar)
Trav3	70	KRM, OMD, UP
Trav4o	58	KRM, OMD, UP, REJ
Trav4l	37	KRM, OMD, UP, REJ, S35 (100 ar)
Trav5	55	KRM, OMD, UP, REJ, S35 (150 ar), S50 (90 ar)
Trav6	64	KRM, OMD, UP, EK, S35 (241 ar), S50 (368 ar)
Trav7	47	KRM, OMD, UP
Trav8	72	KRM, OMD, UP
Trav9	38	KRM, OMD, UP
Trav10	78	KRM, OMD, UP, REJ, S35 (544), S50 (142 ar)
Trav11	64	KRM, OMD, UP, REJ, S35 (116 ar)
Trav12	70	KRM, OMD, UP, EK, S35 (54 ar), S50 (32 ar)
Trav13	59	KRM, OMD, UP, REJ, S35 (150 ar), S50 (180 ar)
Trav14	68	KRM, OMD, UP, REJ, S35 (20 ar), S50 (23 ar)
Trav15	64	KRM, OMD, UP, REJ, S35 (107 ar)
Trav16	30	KRM, OMD, UP
Trav17	51	KRM, OMD, UP, REJ, S35 (260 ar), S50 (99 ar)
Trav18	60	KRM, OMD, UP
Trav19	49	KRM, OMD, UP
Trav20	27	KRM, OMD, UP

4 CONCLUSIONS

Part-time farms prevail, comprising 45% of the analysed areas, which is more than average for Slovenia (35.1%) for the year 2000 (Udovč et al., 2006). Part-time farms earn their income from agricultural activities and activities outside the farm.

Farmers cultivate their own and hired land; 65% of agricultural land is owned by the farmers, on average 7.8 ha per farm. Farms between 5 and 10 ha represent the biggest share (40%).

The educational structure shows that 38% of farm holders have elementary or lower education. The reason for lower education could be the markedly high age of farmers.

The age structure of farm holders is unfavourable; 38% of them are older than 55 years. The average age of farmers in the analysed area is 56.5 years.

CCA analysis showed which eco-socio-economic factors are best linked to the composition of grasslands. Most notable were three grasslands that were intensively used, at lower altitudes, having higher frequency use (more than three cuttings per season), having greater impact of LSU/ha, they are more fertilized with N (kg N/ha/year), used only by mowing and having higher usage of mineral fertilizer (kg/ha/year). With regard to socioeconomic factors, these grasslands were linked with lower ages of farmers and their higher education. In contrast, linked with eco-socioeconomic factors, was group of three grasslands with extensive use, on two of which the occurrence of endangered plants on acidic soils was linked with higher altitude, lower education levels of farm holders, higher age of farm holders, smaller impact by LSU/ha, small input of organic fertilisers (kg/ha/year), absence of mineral fertiliser use and combined grassland use (grazing and mowing).

Socio-economic factors, such as the age and education of farm holders, significantly influence the intensity of farming. Our results showed that

farmers on intensively used grasslands are younger and have higher education levels than those on grasslands, which are more extensively used by farm holders that are older and less educated. From this, we can conclude that the younger generation of farmers is inclined to more intensive farming than older ones, and that younger farmers are not yet ecologically educated.

In the evaluation of the efficiency of agro-environmental measures in relation to plant species diversity and the conservation of habitats in the analysed area, we have concluded that the majority of farmers take part only in basic measures. Such grasslands are poor with regard to the number of plant species, averaging less than 50 species. In contrast, the grasslands for which additional measures have been taken (KOP and SKOP measures), the number of plant species is higher, between 51 to 78 species, among them some sensitive ones.

For better evaluation of the efficiency of these agro-environmental measures, longer-term monitoring would be necessary.

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