

Relationships between production system of Slovenian mountain farms and dynamics of overgrowing areas

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Overgrowing of agricultural land is becoming the serious problem not only in Slovenia but also elsewhere in Europe although the reasons for overgrowing is not everywhere the same. Most frequent reasons stated for expansion of overgrowing areas in Slovenia are inconvenient natural conditions, socio-economic and political circumstances. Thus the efforts against overgrowing and understanding the background of the process are for particular importance.

In the study the relations between overgrowing areas and production system on mountain farms in Nord-east of Slovenia were estimated. For data analysis basic descriptive statistic was collected and carried out with the factor analysis. The data were processed with the program SPSS. The results obtained shows that the statistical significant correlations between overgrowing and some production system exist, although the results are rather unexpected. The highest correlations to overgrowing have the wood production, wood processing and field crops. All other production systems used in the study are not correlated to overgrowing with statistical significance. The scientific reasons of such research results are difficult to explain because of a rather small sample of farms and of poor expertises made on links and connections between overgrowing areas, natural conditions, production orientation and especially socio-economic conditions. This defect could be the topic for a more detailed research in the near future.

Key words: production system, mountain farms, overgrowing of agricultural land

INTRODUCTION

Natural agricultural resources in Slovenia are diverse, but mostly they can be characterized as unfavorable. The basic features are dense forest cover, unfavorable relief and a high proportion of pure grassland. Regarding Geographical Information System and the data on cultivation of land, Hrvatin and Perko (2003) note that forests cover 60.3% of Slovenian surface.

Agricultural production is rendered difficult in one way or another on more than 70% of agricultural land (defined as Less Favored Areas – from now on: LFA). This fact places Slovenia among the countries with the most difficult conditions for agricultural production in Europe. The major portion of agricultural land with unfavorable conditions for production is located in the highlands and mountainous regions, which represent 49% of all agricultural land in Slovenia (Committee of ICID: http://www.icid.org/v_slovenia.pdf).

In Slovenia, overgrowing with forest increased in last 47 years by 16% and according to the official data the area of forests is still increasing (Krajnc 2003). According to Perpar (2002) the main reason for overgrowing is the abandonment of agricultural land. The abandoning of farmland and overgrowing of agricultural land is not a new phenomenon in Slovenia. The process has been going on since the beginning of the last century, and at an accelerated rate after the World War II (Hudoklin 2004).

According to stated data, overgrowing of agricultural land by forest is a serious problem in Slovenia (Slovenia Agri-Food Country Profile: <http://atn-riac.agr.ca/europe/e3222.pdf#search='Slovenia%20AgriFood%20Country%20Profile,%2.20042004>).

Also, many EU countries are faced with overgrowing of agricultural land although the reasons for overgrowing are not everywhere the same (Peterson and Aunap 1998; Talvik 2002; Krajnc 2003; Litsfeld 2003).

With regard to the CORINE land cover map the overgrowing in Slovenia can be found mainly in LFA areas (Ministry of Agriculture Forestry and Food, 2004).

The main reasons for overgrowing in Slovenia are inconvenient natural conditions and socio-economic and political circumstances (Golob at al. 1994).

Talking about consequences of overgrowing there are

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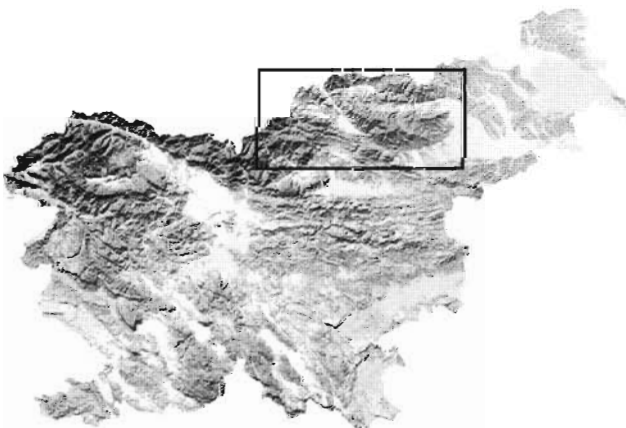
many negative outcomes of overgrowing of agricultural land: less cultivated agricultural land, overgrowing of cultural landscapes (Perpar 2002), overgrowing of panoramic landscapes, game animals moving to walleys to the cultivated landscape, low quality and less economic interest in young forests (http://www.radiokobarid.si/news/news_archive_show.php?file=arhiv/n_01302.txt), serious loss of the existing biodiversity (rural areas news link: http://www.ieep.org.uk/PDFfiles/PUBLICATIONS/RuralAreasNewslink/Newslink8_GB.pdf, 2004; <http://www.rtd.si/slo/6op/podr/trajraz/globeko/gradivo/inc/Juntas-A11-TriCo-6FW-Ljubljana.pdf>, 2004; Red List of Plant and Animal Species in Denmark <http://www.sns.dk/netpub/rodliste/3summary.htm>; 2004).

Irrespective of the fact that in LFA areas forest activities predominate, agriculture production in LFA areas has still an important role for the preservation of the sustained presence of the population and maintenance of the cultural landscape (Slovene Agriculture, Forestry And Food Industry in Figures 1999; Juvančič 1996; Borec 2003; Flambard 2004).

The purpose of this study was to establish relations between production system on mountain farms of Nord-east of Slovenia and overgrowing areas. The hypothesis set up for the study was that production system could affect the presence or absence of overgrowing areas. The hypothesis is based on research findings (Pogačnik et al. 1995; Kompan et al. 1997; Šalehar et al. 2004), which suggest that appropriate solution against overgrowing of agricultural land is breeding of ruminants. The expected result of the study is to find, with suitable statistical instruments, which production system can reduce or even stop the overgrowing of agricultural land.

2 MATERIAL AND METHODS

2.1 Main characteristic of the studied region



Map 1: Location of the studied region (source: www.zrc-sazu.si, 2004)

The studied region is determined as a mountainous region in North-Eastern Slovenia. Due to the rough relief all municipalities in the studied region are classified (according to EC regulation 1257/99) as LFA (Ministry of Agriculture Forestry and Food 2004).

The region is mostly covered with forest both partially anthropogenic and due to overgrowing (Mrakič 2001).

The isolated farm was, and still is, the most typical form of settlement in the studied area. Farms are mostly large (on average the farms use 9 ha of agricultural land and 31.5 ha of forests) and possess a lot of woodlands. Resulting from the geographical distribution and the size of settlements, farms in the region offer an impression of hamlets (Flambard 2004).

The traditional way of farming based on the alpine pasture economy begun to decrease after World War I. A pronounced decline came after World War II when the social and economic transformations have brought radical changes into the traditional organization of the alpine pasture economy (Vojvoda and Senegačnik 1984). Also bad life conditions and perspectives and an increasingly important industrialisation and urbanization in the lowland areas triggered off farm abandoning. Thus pastures started to become overgrown by bushes and trees to the profit of forest plantation (Meze 1984).

The following figure represented the preponderance of the wooded areas for the studied region in 2003.

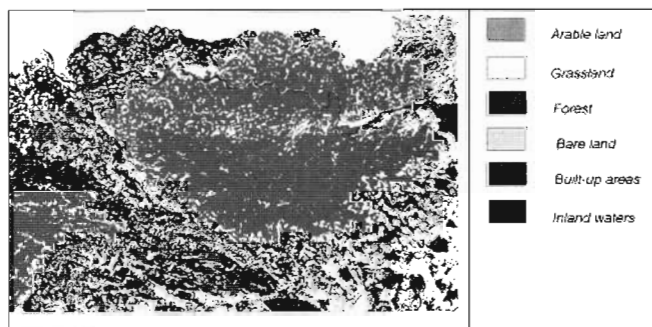


Fig. 1: Land use in 2003 (source: www.stat.si, 2004)

In parallel, the livestock, especially small ruminants, followed the same evolution as pasture areas. If from the second half of the nineteenth century to the beginning of the twentieth century the total livestock had increased a lot, it reduced after World War II. In Sv. Anton (cadastral community on the studied area) Mrakič (2001) asserts that the total livestock has decreased from 1230 in 1938 to only 328 in 1998; this is due to the disappearance of sheep breeding which represented more than half of the total livestock in 1938. In Slovenia, there were 300,000 sheep in 1869 and only 23,000 in 1974 (Pogačnik et al. 1995).

In discussing overgrowing in the studied region the areas that are still in the process to forest ecosystem were also taken into account. Such areas are described as areas being overgrown and where all agricultural activities stopped (Act on Forests, UL RS 30/1993). Simončič et al. (1999) declared those areas as areas, which have started to overgrow 20 or fewer years ago.

Today forestry and cattle breeding provide the main sources of income for the farms and the maintenance of the population. Potatoes, smaller plots of winter and summer corn and silo maize are the only crops on the mountain farms. However, a considerable part of local population is employed in non agrarian activities concentrated in bigger settlements in the valleys (Natek 1993).

2.2. Sample of the farms

The sample comprised 69 farms in the studied region. Of the selected farms, 42 are faced with overgrowing. For the analysis only the farms with overgrowing areas were selected.

2.3 Questionnaire

The entire questionnaire is divided into six parts: basic data of farm, land use and overgrowing, animal production, plant production, investments. The questions related to basic data of farms, land use and overgrowing, animal production and plant production were used for the analysis. Each part had a different number of questions. Questions were both open and closed. For the satisfaction of questionnaire validity, the questions were checked and carried out in accordance to many similar questionnaires, methodological explanations and researches (Kovačič 1996; Brancelj 1999; Kerbler 2003; Glauben et al. 2004; popisni list: http://www.agroport.si/download/pl_1-3.doc).

On the basis of questions nine variables were formed and used for the analysis (the animal variables were gathered according to the animal nutrition – food behaviour):

– Total supplementary activities (according to Statistical Office (2004) and Agriculture Act (2000) total SA on the studied region captures mostly wood processing, sale of wood products, fruit and meat processing);

- Forest;
- Grassland and Orchards (orchards are mostly extensive orchards on grassland);
- Pastures;
- Field crops;
- Cattle (milk cows, suckling cows, bulls);
- Small ruminants (goat and sheep);
- Other herbivores (horse, deer);
- Non herbivores (pig, rabbit and poultry).

2.4 Procedure

The questionnaires were carried out in June and July 2004. The filling in of questionnaires lasted approximately two hours for each farm. Farmers were well acquainted with the filling in of the questionnaire. No questionnaires were eliminated because of incorrect filling. Well-qualified experts performed the questionnaire. Questions were answered by farm proprietors or their near relatives.

2.5 Analysis

All analyses were performed using an SPSS 12.0 for Windows statistical package. First, the basic descriptive statistic was collected. Then, the factor analysis was carried out. The Hotteling principal component method was used for the extraction of factors. The number of relevant factors was identified using the Guttman-Kaiser criterion, according to which the important factors are those whose eigenvalue is equal to or greater than 1.00. The obtained factors were the base for the estimation of the correlation with overgrowing areas.

3. RESULTS AND DISCUSSION

The overgrowing average on 42 surveyed farms is 6% of farm's total farmland. The most overgrown are grassland and pastures. On Figure 2, the overgrown areas replacing pastures and grassland are presented under Landfrid farm.

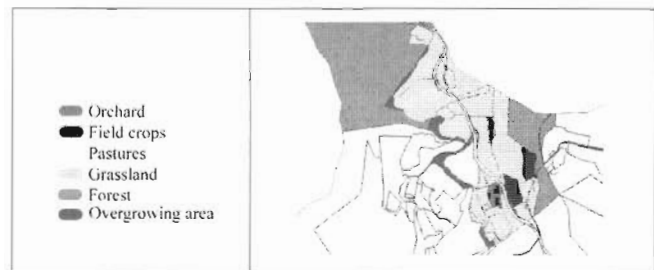


Fig. 2: Localisation of overgrowing area on Landfrid farm

The land use organisation of farms with overgrowing areas is as follows: 70% of forests, 18% of grassland, 10% of pastures, the rest are fields and orchards. The threatened farms are larger and with more animal pressure per hectare compared with the Slovenian average. The farms are directed towards mixed agricultural production (78%), and 21.4% to livestock production.

According to the socio-economic status of farms (after Kovačič 1996) part time farms predominate with 50%, followed by full time farms (33.3%). Aged farms present 7.1% and supplementary farms 2.4% of total share. The rest are living farms with no agricultural land (all cultivable land is let out). Regarding basic data forestry and agriculture are the prevailing economic activities in the studied region.

Using the factor analysis, the main results are represented first, followed by the correlations between factors and overgrowing areas and interpretation of results.

From the correlation matrix of variables four factors were extracted using the Guttman-Kaiser criterion (Table 1). The first four factors explained 70.2% of the total variance. The percentage of the first factor is 24.8, of the second 17.9, of the third 15.1 and of the fourth 12.4 of total variance.

Table 1: Eigenvalues and percentage of the explained variance of each factor

Factor	Eigenvalues	of Variance	Cumulative
1	2.230	24.777	24.777
2	1.615	17.941	42.719
3	1.359	15.102	57.821
4	1.114	12.379	70.200
5	0.834	9.262	79.462
6	0.712	7.914	87.376
7	0.527	5.850	93.226
8	0.454	5.041	98.267
9	0.156	1.733	100.000

In Table 2, the projections of selected variables on each factor are presented.

The obtained factors were used to calculate the correlations within overgrowing areas. For factor 1, the projections are higher than 0.30 by eighth variables, for factor 2 and 3 the projections are higher than 0.30 by four variables and for factor 4 the projections are higher than 0.30 by tree variables.

Table 2: Factors Matrix

Variables	Factor 1	Factor 2	Factor 3	Factor 4
Total SA	0.305	0.584	0.176	0.496
Forest	0.415	-0.162	-0.118	0.649
Grass. And Orch.	0.736	0.238	0.180	0.109
Pastures	0.485	-0.254	0.702	-0.188
Field crops	0.518	0.297	-0.038	-0.587
Cattle	0.703	0.294	-0.184	-0.111
Small ruminants	-0.533	0.467	0.431	0.146
Other ruminants	0.086	-0.601	0.628	0.075
Non ruminants	-0.366	0.611	0.417	-0.122

Correlation coefficients between factors and overgrowing areas are presented in Table 3. Only factor 4 with 0.324 has a statistically significant correlation by $p < 0.05$ level.

Table 3: Correlations between overgrowing areas and factors

	Factor 1	Factor 2	Factor 3	Factor 4
Overgrowing	0.111	-0.080	-0.135	0.324*

* $p < 0.05$

Table 2 shows that the highest correlations (Factor 4) have the following variables: Forest (0.649), Total SA, (0.496) and Field crops (-0.587).

The results shows that most variables used (Grassland and orchards, Pastures, Cattle, Small ruminants, Other ruminants and Non ruminants) are not correlated to overgrowing areas with statistical significance. This is not fully in accordance with our expectations. The correlation of forest is clear; then more the farm faces overgrowing more areas are forested. The same understandable correlation is with total SA, thus the most frequent SA in the studied region are connected with wood processing. The negative correlation with field crops is also reasonable in the way that the farms directed to field crops and with more focused production orientation (in the case to field crops) faced less overgrowing areas. We could conclude that for the positive correlation (with statistical significance) forest with wood production system and wood processing orientation of farms are most decisive.

More surprising are low correlations of cattle and ruminants. We expected, because of their food behaviour, statistical significance. The scientific reasons of such research results are difficult to explain because of a rather small sample of farms and of poor expertises made on links and connections between overgrowing areas, natural conditions, production orientation and especially socio-economic conditions. This defect could be the topic for a more detailed research in the near future.

4. CONCLUSION

In North-Eastern Slovenian mountains, natural conditions are not suitable for agriculture mainly because of rough relief and a unfavourable climate. For the last hundred years, this region has faced problems of depopulation and consequently a falling number of livestock and abandoning of land cultivation. As a result, the overgrown areas have continuously progressed on farmlands.

Based on a sample of 42 farms with overgrowing areas the correlation between different production system and overgrowing was estimated. The results obtained shows that the statistical significant correlations between overgrowing and production system are positive only with wood production and total SA or in other words, wood processing and negative with field crops.

The results are rather unexpected regarding our hypothesis, namely, that farms with cattle and other ruminants breeding will be faced with less overgrowing area. This hypothesis is based on different proposals and projects that have been done in Slovenia against overgrowing (Pogačnik et al. 1995; Kompan et al. 1997; Šalehar et al. 2004; Bilten: <http://www.ilbis.com/spark/st7c15.htm> 2004). Common to all stated references is that the most appropriate solution against overgrowing and also for preserving the biodiversity were breeding of cattle or small ruminants (sheep and goats).

Similar findings especially regarding biodiversity preservation were reported also in Norway (Grazing Helps to Maintain Biodiversity: <http://www.nordgen.org/download/artikkel-nghnytt-eng-grassing.doc>.2004). With the data used in the study the hypothesis given in the introduction cannot be confirmed.

The reasons for such results could be explained as follows:

- in the studied region is no intensive ruminants breeding and no large herds of ruminants;
- the ruminants breeding is devoted more or less only for domestic use;
- the sample of threatened farms was small;
- socio-economic and natural conditions consideration of studied region were left out.

With the data used in the study we could conclude that the statistical significant correlations between overgrowing and some production system exist (wood production, wood processing and field crops) although the results are rather unexpected regarding our hypothesis.

Lastly, by intergrating, in next studies, natural conditions, socio-economic factors and the national and international political context, the richness and the complexity of such data would enhance a global prospective of the overgrowing problem.

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