



## Analyzing post-socialist grassland conversion in a traditional agricultural landscape – Case study Croatia



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### ABSTRACT

Shrub encroachment and agricultural intensification have been a widespread occurrence in the former communist and socialist countries of Central and Eastern Europe. Such changes have strongly affected grassland areas which are seen as hotspots of biodiversity in Europe. In this study we have investigated the changes in grassland cover as well as the causal mechanism of those changes in a selected region in Northern Croatia during the post-socialist transition. By using the mixed methods approach we combined remote sensing, statistical modelling and a household-based questionnaire ( $n = 285$ ) to map the changes in the grassland cover and to assess the socio-economic and bio-physical contributing factors of the documented changes. The results demonstrate that areas seeing general depopulation trends and population ageing, along with increases in the amount of educated people are characterized by shrub encroachment and farmland abandonment, while flatlands and lowland areas are seeing higher rates of grassland to farmland conversion. The results also show that the partial de-agrarization characteristic for the socialist period has become a full de-agrarization in the post-socialist period, with the main impetus being education, rather than employment, as was the case during socialism.

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### 1. Introduction

Agricultural landscapes have been changing rapidly in Europe in the last 50 years as a consequence of different environmental, demographic, economic and political trends. The two most common processes of change in agricultural land use are the abandonment of traditionally managed farmland and the acquisition of a modern regime of agricultural management (Gerard et al., 2010; Osawa et al., 2013; Regos et al., 2015; Caraveli, 2000; MacDonald et al., 2000). The consequence of both has been the dramatic reduction of grassland areas in many parts of Europe. Grassland areas have either been transformed into arable fields due to intensification, or, as part of the process of abandoning grazing and mowing, they are increasingly being encroached upon by shrubs and forests (Hellesen and Levin, 2014; Meshinev et al., 2000; Vassilev et al.,

2011; Tasser et al., 2007). Evidence of this has been documented in parts of the Iberian Peninsula, the Alps, and along the Mediterranean, as well as some areas of Northern, Central and Eastern Europe (Diogo and Koomen, 2012; Maestre et al., 2009; Komac et al., 2013; Biró et al., 2013; Rutherford et al., 2008; Zimmermann et al., 2010; Vigl et al., 2016).

A positive impact from such changes in land use and land cover can be seen in relation to forest succession – declines in fragmentation of habitats and increases in undisturbed habitats (Pazúr et al., 2014; Kuemmerle et al., 2010), reduced erosion (Renwick et al., 2013) or mitigating climate change through increased carbon sequestration (Silver et al., 2000). However, the preservation of grassland areas is crucial to biodiversity in agricultural landscapes. An estimated 50% of all species in Europe depend on extensively managed habitats such as grasslands (Hellesen and Levin, 2014). Moreover, the increased rates of shrub encroachment which are a direct result of agricultural abandonment, lead to an increased risk of fire (Pavlek et al., 2016; Nunes et al., 2005; Martínez et al., 2009) as well as changes in the landscape and potential loss of its cultural-historic values (Baránková et al., 2011; Shucksmith and Rønningen,

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2011).

The rates of land use change observed in the former socialist countries of Eastern and Central Europe have been especially high (Pazúr et al., 2014; Müller et al., 2013; Cvitanović et al., 2016; Lieskovský et al., 2015; Václavík and Rogan, 2009; Taff et al., 2010; Baumann et al., 2011; Skokanová et al., 2016). The rapid political changes which took place in these countries have completely transformed their economic policies and markets. The process of restitution of nationalised properties was started, and a number of obsolete industries collapsed, resulting in increased unemployment. The restitution of properties along with the reduction of state interference and input into agriculture left its mark on both the structure and size of agricultural properties which in turn influenced land use outcomes, resulting in large tracts of land being abandoned in a relatively short period of time (Müller et al., 2013; Lerman, 2001).

Political driving forces had an important role in those processes, i.e. the afore-mentioned withdrawal of the state from the agricultural sector and the individualisation of land use. There are, however, notable exceptions to this process. After the end of the Second World War the communist government of Yugoslavia had several attempts at collectivization, but the practice of collectivism was abandoned by the end of the 1950s and between 81% and 89% of agricultural land ended up back in private hands (Bičanić, 2010; Orazem, 1989). Thus, since 1950s the organization of Yugoslav agriculture has been bimodal, consisting of a socialist sector and private farming sector. Socialised agricultural enterprises encompassed less than 20% of land but had access to agro-technical services and agricultural subsidies, used nearly 40% of the total amount of mineral fertilizer and significantly contributed to production of wheat, rye, barley, corn and oats for the Yugoslavian market. On the other hand, private subsistence farms were mostly focused on household needs rather than to the market. They also received subsidies, but only under special circumstances and on a much lower level (Orazem, 1989). Furthermore, farmers with farms close to agricultural maximum in size (10 ha) were precluded by law from purchasing or leasing smaller holdings which could make the use of modern technology more economical (Orazem, 1989).

Such policies resulted in the decay of the Yugoslavian agricultural sector. Rapid industrialization was favoured over agricultural development, which resulted in massive emigration from rural to urban areas, causing a sharp decrease in agricultural employment (Allcock, 2000; Lukić, 2012). This trend of rapid decrease of agricultural population continued in the following decades. The land itself, however, was not abandoned to a large extent. Persisting difficulties in providing adequate urban housing made it impossible for the people working their new urban jobs to completely abandon their rural residences. These so-called “peasant-workers” undertook commutes from rural areas to urban centres (Allcock, 2000; Vresk, 1972). This provided the foundation for sustaining the small land-owner structure and a traditional agricultural landscape created through the reforms after the Second World War. An important role in maintaining the relative stability patterns of land holding over the entire socialist period was played by the development of tourism which took off in the 1970s, especially in Croatia, one of the six constituent republics of Yugoslavia. The impact of emigrant remittances is not to be discounted either. The 1980s saw more than a million privately owned estates smaller than 2 ha with an additional 1.3 million in the 2–10 ha category. The mixed pattern of private agricultural management is also apparent from the fact that in 1981 only around 25% of Croatian households made a living solely from their agricultural income, and only 25% made their living solely from their non-agricultural income (Allcock, 2000). However, although limited, research dealing with agricultural abandonment in Croatia during socialism has shown an increase in

grassland areas in latter periods of socialism, mostly due to previously mentioned processes of de-agrarization, de-ruralization and subsequent migration to cities (Crkvenčić, 1981; Vresk, 1972). Abandoned land (i.e. grasslands) was often termed “social fallow” (Hartke, 1953) signifying the importance of social changes in land use and land cover changes.

After the break-up of Yugoslavia in 1991, the management of agricultural lands, including grassland areas, was not faced with problems of restitution, but still it went through the process of adapting to the new economic circumstances. Managed grasslands as a base for livestock had to deal with numerous unfavourable characteristics inherited from the socialist era – land holdings were mostly too small to sustain any form of commercial agriculture and had, on average, a very small number of cattle (<2) per agricultural household which were kept in inadequate facilities. The lack of agricultural subsidies in the newly liberalized market had a further impact on changes in the traditional forms of agriculture, but to a lesser extent (Todorović and Drobnjaković, 2010; Feldhofer and Deneš, 1997).

This raises an important question about how the economic and demographic changes as well as bio-physical characteristics have influenced grasslands and grassland management in the post-socialist era. The data from the Croatian Environmental Agency (CEA) based on the Corine Land Cover gives us some information on changes in the land cover in Croatia during the studied period. According to CEA (Voća, 2014), the areas consisting of grasslands have been slowly but constantly increasing in Croatia during the 1990–2012 period and amount to around 21% of the surface area today. However, the grassland areas which remained unchanged in the studied periods have since reduced in size; so the overall increase comes from the changes in other types of land cover (usually forests and/or arable land) which are being converted to grasslands. Those changes are often temporary transitions from one land cover type to another, for example, agricultural land being permanently abandoned which eventually leads to shrub encroachment and forest succession, while permanent grasslands are endangered (Helleesen and Levin, 2014; Plieninger, 2006). Additionally, such data is only gathered on a national level and doesn't include local or regional characteristics. Furthermore, to the best of our knowledge, there are no analyses in Croatia or any other country of former Yugoslavia which deal with characteristics of the changes in grassland cover after the collapse of socialism. This paper aims to fill that gap by examining the changes in grassland cover and providing evidence of the factors contributing to those changes. By using an appropriate study site in Northern Croatia this research addressed the following specific objectives:

- a) To map changes in grassland and agricultural land cover using repeated remotely-sensed images to assess the magnitude and distribution of such changes during the post-socialist period;
- b) To investigate the relationships between changes in land use/cover and physical geographic and socio-economic factors at the local and regional scale;
- c) To analyse the causal mechanism of land use/cover change by exploring the decision-making processes related to grassland management and livelihood strategies at the local/household scale.

## 2. The study area

The study was carried out in the Krapina-Zagorje County in Northern Croatia (Fig. 1). Bordering Slovenia to the east, Zagreb to the south and Varaždin County to the north and east, it is a typical rural area of Croatia characterised with small dispersed settlements

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