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PASTURE LANDSCAPE DURABILITY IN THE BESKID MOUNTAINS (WESTERN CARPATHIANS, POLAND)

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Abstract

The agricultural abandonment and reforestation taking place over the last few decades in the Carpathians has led to accelerated transformation of pasture landscape. The trajectories of pasture landscape changes, the factors threatening and supporting the pastures' traditional use have been established on the basis of archival and contemporary cartographic materials, historical scientific works and archival photographs. An attempt has also been made to assess pasture landscape durability. The major part of the former pasture landscape has evolved into forest or settlement landscapes. The pasture landscape durability will only be possible if the operations supporting the traditional mountain grazing are continued.

Key words

pasture landscape durability • pasture landscape • mountain land management • agricultural abandonment • mountain grazing • rangeland pastures • rangeland management • Western Carpathian Mountains • Silesian and Żywiec Beskids

Introduction

In Poland, as in many places all over the world, the relative contribution of agriculture to the total GDP (gross domestic product) is decreasing. As a consequence of this process, there are land use changes resulting in decreased use of agriculture land. These changes particularly concern the areas characterised by a high level of the socio-economic development (Trzepacz 2012). The progress of the rural areas' functional diversification, in particular in the vicinity of large cities, comes at the expense of agricultural land decrease (Gerard et al. 2010). Abandoning agriculture can be also observed in the regions of small-area property or in the regions with low-quality soils (Kozak 2004, 2005; Plieninger et al. 2016). This is connected with selling land for various purposes, including recreational buildings – summer houses or developer estates, suburban investments – logistics-warehouses,

service and municipal centres or construction of roads and highways (Sobala & Myga-Piątek 2016). These changes are accompanied by ongoing secondary forest succession (field overgrowing), dispersion of settlements, and the loss of the sightseeing potential and aesthetic value of rural settlements (Gerard et al. 2006). What is more, the disappearance of landscape landmarks is associated with these processes. These landmarks are objects or groups of such objects, as well as land cover patches (i.e. groves, ponds, distinctive farm buildings etc.), which emphasize the specificity and dissimilarity of a particular area's landscape. They are a particularly clear sign of spatial forms derived from different stages of landscape development, as well as a symbol of the phenomena and processes which generate them. Landmark disappearance may be treated as an indication of landscape transformation often contributing to landscape unification (Myga-Piątek et al. 2015; Sobala & Myga-Piątek 2016).

The problems connected with the decrease in the economic importance of agriculture affect especially in the mountains areas. These areas fulfil many significant functions connected with several crucial values. According to the Mountain Areas in Europe report (EC 2004), mountains are of vital importance to the continent's population in the following main ways:

- as 'water towers' supplying most of the continent with water, especially in summer, and as sources of hydroelectric power;
- as centres of diversity, both biological and cultural;
- as centres of cultural and ethnical diversity they are the home for the European ethnic minority with their specific languages, dialects and traditions;
- providing opportunities for recreation and tourism, based on natural attributes and cultural heritage;
- their sensitivity to environmental change may have major consequences in both mountain areas and downstream.

The abovementioned functions may be treated as universal for all mountain areas around the world.

The global importance of mountains is increasingly recognised, as shown by the inclusion of a specific chapter in Agenda 21 ("Managing Fragile Ecosystems: Sustainable Mountain Development") during the Earth Summit in Rio de Janeiro in 1992. In 1991, eight states and the European Union signed the Alpine Convention. This fact may be treated as a recognition of the great importance of the Alps which goes beyond the states' boundaries and requires actions on the international level. In 2003, following the first convention dedicated to mountain areas, seven states signed the Framework Convention on the Protection and Sustainable Development of the Carpathians (Carpathian Convention). This convention pursues a comprehensive policy and cooperation in the protection and sustainable development of the Carpathians. Designed to be an innovative instrument to ensure protection and foster sustainable development of this outstanding region and living environment, the Convention aims to improve the quality of life and to strengthen local economies and communities. In 2015, the EU strategy for the Alpine region was drawn up and there are also calls for producing a similar strategy for the Carpathian region.

In mountain areas, due to the unfavourable impact of economic transformations, the decline in the profitability of agricultural production, and, as a consequence, its decrease through the abandonment of agricultural lands, occurs more rapidly (Baldock et al. 1996; MacDonald et al. 2000; Rudel et al. 2000; Müller & Zeller 2002; Kozak 2004; Gellrich et al. 2007; Griffiths et al. 2014; Munteanu et al. 2014). The economic and demographic marginalisation processes in mountain areas have particularly negative consequences.

In the past, sheep farming had great importance in the Carpathians as well as in many other mountain areas. As a result of human adaptation to the mountain environment conditions, pasture landscapes were formed across large areas (Sobala 2014, 2016). The mountain pastures and glades

used for centuries as well as wooden farm buildings (huts and sheds) became landmarks of the Carpathian landscape. Because of the decreased importance of sheep farming in recent years, the durability of the pasture landscape is endangered. The agricultural abandonment and reforestation taking place over the last few decades led to an accelerated pasture landscape transformation (Munteanu et al. 2014).

On the other hand, in recent years great attention has been paid to the importance of traditional mountain grazing for the local economy, the quality of the inhabitants' life and the conservation of natural and cultural values. This subject was discussed during the three editions of the International Shepherd Conference organized in Poland in the years 2013, 2014 and 2016. Furthermore, programs supporting traditional mountain grazing are being implemented in selected areas, i.e. cultural grazing in the Tatra National Park, 'Owca Plus' and 'Life+' in the Silesian and Żywiec Beskids, 'Karpaty Łączą' in the Żywiec and Sądecki Beskids and in the Gorce Mountains (Sobala 2014). The increasing interest in the continuation of traditional grazing in the Carpathians leads to the following questions. What are the trajectories of change in pasture landscapes in regard to the extent and characteristics? What factors are threatening and supporting their traditional use? What are the major factors which should be considered in steps aimed at pasture landscape optimization? The aim of the article is an attempt to find answers to these questions, as well as an attempt to assess the pasture landscape durability in the Carpathians on the basis of detailed investigation.

Materials and Methods

Study area

The Beskids stretches for about 600 km from the Bečva River in the west to the Cheremosh River in the east, and reaches a width of about 50-70 km. For detailed investigations, two study areas of a similar surface area (about 45 km^2) were selected: a part of the Wiślańskie mountain range located in the Silesian Beskids and a part of the Raczańskie mountain range located in the Żywiec Beskid range (Fig. 1). Both of them are characterized by medium and low mountain relief with steep slopes (mean elevation > 800 m a.s.l.). The basement is made from formations of the Godula Nappe and the Magura Nappe of the Carpathian Flysch Belt. The areas span over three vertical climatic zones, namely, moderate warm (with mean temperature > 6°C), moderate cool (4-6°C) and cool (< 4°C). Annual precipitation on the highest ridges (Skrzyczne or Wielka Racza) reaches 1300 mm. The natural conditions of the area are suitable to forests and meadows/grasslands, whereas current land use reflects the socio-political and economic conditions in the late 19th century, when the Beskid region was heavily populated and large areas were deforested for agricultural use, despite unfavourable topographic-, soil- and climatic conditions (Sobala 2012). This has generated the current traditional landscape typical of the Beskid region, with buildings situated in the valley bottom on lower river terraces with accompanying woods and shrubs, and cropfields perpendicular to the valley bottom divided by clearly marked baulks, which reach up to the edge of the forest on mountain ridges. Numerous clearings with farmsteads are located in flat areas of the forest, and mountain ridges includes pasture grounds which recently decreased in area due to the abandonment of breeding farm management.

Contemporarily, these areas are conserved as landscape parks: Żywiec Landscape Park and Silesian Beskid Landscape Park (Journal of Laws from 2004, No. 92, item 880, as amended) and Natura 2000 sites (PLH240005 Silesian Beskids, PLH240006 Żywiec Beskids, PLB240002 Żywiec Beskids). This enhances the possibility of conserving them.

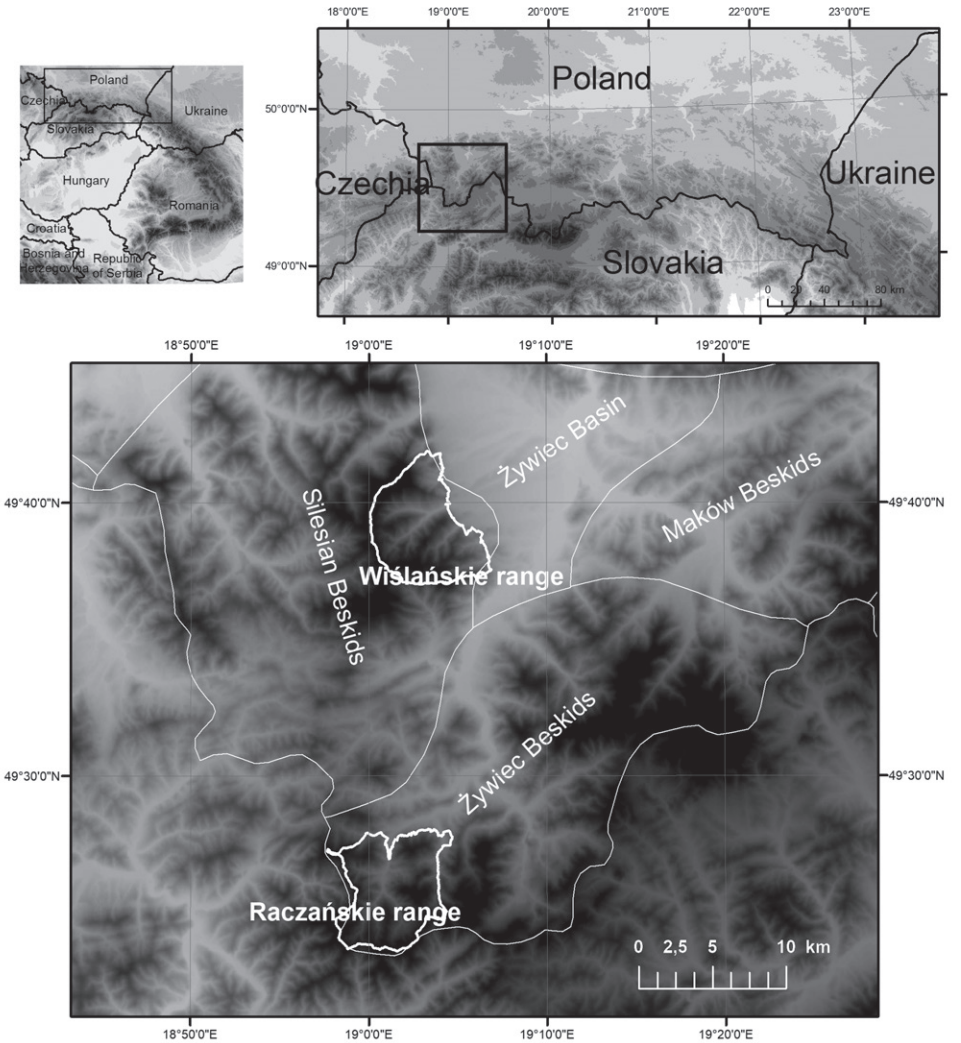

Figure 1. Location of the study area

Materials and research methods

To identify the trajectories of changes in pasture landscapes, evolutionary method was used. It was assumed that the cultural landscape has a "stratigraphic" construction (the stratigraphic model according to Myga-Piątek 2012). To that end, archival and contemporarily cartographic materials, historical scientific works (i.a. Sawicki 1919; Kubijowicz 1927; Kawecki 1939; Broda 1956; Kopczyńska-Jaworska 1967; Dorywalska 1969) and archival photographs (collections from the City Museum of Żywiec) were used. The factors threatening and supporting pasture landscape durability were recognized on the basis of an analysis of the trajectories of changes in pasture landscape and contemporary land use. Moreover, the author carried out an analysis of the current legal-administrative conditions: local zoning plans for Rajcza, Lipowa and Radziechowy-Wieprz communes, documentation for the conservation plans of the

Żywiec Landscape Park and Silesian Beskid Landscape Park, conservation plans for Natura 2000 sites: PLB240002 and PLH240006, management strategies for Natura 2000 sites: PLH240005 and PLH240006 and legal regulations – the Nature Conservation Act (Journal of Laws from 2004, No. 92, item 880, as amended) and the act on 24th of April 2015 on changes in some acts in connection with the reinforcement of landscape protection tools (Journal of Laws from 2015, item 774). The conclusions of the 3rd International Shepherd Conference "The Cultural Landscape of the Carpathians – the Common Heritage of Nature and Man", which took place on 7-8 March 2016 in Zakopane, were also included. These analyses formed the basis of an attempt to assess the durability of pasture landscape in the area being studied.

The following cartographical materials were used:

- Austrian cadastral maps from 1848 scaled at 1:2,880,
- a Spezialkarte der Österreichisch-Ungarischen Monarchie map from 1879-1885 scaled at 1:75,000
- a WIG military map from 1933 scaled at 1:100,000,
- a military topographic map from 1960-1975 scaled at 1:25,000,
- a topographic map from 1979 scaled at 1:10,000,
- a contemporarily land use maps made by the author on the basis of the land use mapping and orthophotomap from 2009.

For the analysis only maps based on direct field mapping were selected in this study. Author decided to select map series with similar scales and objectives; however, serious difficulties to match such criteria were encountered. Therefore, only six of the seven maps acquired were used in this study. All the historical maps were georeferenced in two steps, which consisted in calculating the transformation matrix and carrying out proper geometric transformation and interpolation resampling of a distorted image to a new raster of regular size (i.e., the so-called "rubbersheeting"). Such two-step process allowed a higher georeferencing accuracy, which ensures the quality of results obtained and increases the confidence in the conclusions. In each case, georeferencing was specifically adjusted to the quality and type of data, so as to achieve the best possible results for each series.

Austrian cadastral maps were overlaid onto a grid with a size corresponding to the map frame size using affine transformation and the coordinates of the frame corners. Rectification was then carried out and its precision verified by estimating the root-mean-square error (RMSE), which was < 4.91 m for each map sheet.

The *Spezialkarte der Österreichisch-Ungarischen Monarchie* was georeferenced only by means of control points of the reference layer using the affine transformation. This kind of georeferencing of a single map sheet gives better results than that based on fitting the corners in the millimeter mesh (Affek 2013).

The military maps were georeferenced by overlaying the corner points of the raster image onto the grid with a size corresponding to the map frame size using affine transformation. Rectification was then carried out and the image was adjusted to the reference layer using control points.

For all maps, historical local reference system was transformed into the contemporary global system. This step involved the application of a simplified Helmert transformation with three parameters (dx, dy, dz) of the shift in the coordinate system origin using the inverse Molodensky formulas (Sobala 2012).

The processed cartographic materials underwent screen digitization using the snapping method. Errors are usually generated during this operation, e.g., duplicating arcs, floating- or short lines, overlapping lines, overshoots and undershoots, unclosed and weird polygons (Maras et al. 2010). A topology construction tool was used to detect and eliminate these errors. Screen digitization was combined with the creation of a database

of land-use and land-cover forms. By aggregating the data included in each series of maps, land-cover maps were developed where forest and non-forest areas were clearly distinguishable. In both cases, the road network and the hydrographic network were attached to the adjoining polygons, as the boundaries ran along roads and watercourses. As a result of the procedures described above, vector maps were created which allowed spatial analyses to be carried out. The V_LATE add-on of the package ArcGIS® ver. 10.2.2 was used, which allowed to calculate land cover in each time section.

The maps used in this study differ both in terms of scale (from 1:2,880 of the Austrian cadastral maps to 1:100,000 of the WIG military maps), their use (military or administrative purposes) and map projection. Therefore, results based on these maps need careful interpretation and verification using other data sources. Furthermore, the results could be affected by errors occurring at each stage of the creation of a digital map; particularly, georeferencing greatly affects the quality of results. Furthermore, the information value of map data is lower compared to direct source data, having a lower precision and accuracy. Being aware of the limitations of maps is the basis for drawing correct conclusions (Plit 2006).

The dynamics of changes in land cover in two areas of the Beskid mountains were assessed by comparing the distribution and extension of different land cover types on maps from different time intervals. Although the results obtained should not be treated as absolute, it was still possible to assess the trends related to changes in land cover in the study areas.

Results

Land cover changes in 1848-2014

The non-forest cover decreased systematically in the period 1848-2014 due to the abandonment of agriculture (Tab. 1, 2; Fig. 2, 3). The decrease in non-forest cover in the Raczańskie mountain range was higher than that observed in the Wiślańskie mountain range (16.7% vs. 11.8%, respectively). The greatest changes in the Wiślańskie mountain range, affecting 6.8% of the examined region, took place between 1933 and 1960, whereas in the Raczańskie mountain range non-forest cover changed continuously since 1933 and involve 14% of the investigated area.

Table 1. The changes in non-forest areas in percentage in the period 1848-2014

Wiślańskie mountain range		Raczańskie mountain range	
Year	Non-forest areas (%)	Year	Non-forest areas (%)
1848	17.9	1848	31.2
1879	17.7	1885	30.6
1933	14.8	1933	28.5
1960	8.0	1975	21.2
1979	6.5	1979	20.6
2014	6.1	2014	14.5

Table 2. The dynamics of non-forest land cover changes in period 1848-2014

Time interval	Non-forest area decline (ha)	Non-forest area decline (%)	Non-forest area decline between t +1 and t (%)
Wiślańskie mountain range			
1848-1879	8.4	0.2	1.0
1879-1933	133.6	2.9	17.6
1933-1960	304.2	6.8	55.3
1960-1979	68.6	1.5	63.8
1979-2014	16.3	0.4	65.8
Raczańskie mountain range			
1848-1885	26.2	0.6	1.8
1885-1933	98.5	2.1	8.8
1933-1975	329.7	7.3	31.9
1975-1979	27.2	0.6	33.8
1979-2014	280.3	6.1	53.5

Pasture landscape evolution stages

The following stages of pasture landscape evolution in the study area may be indicated:

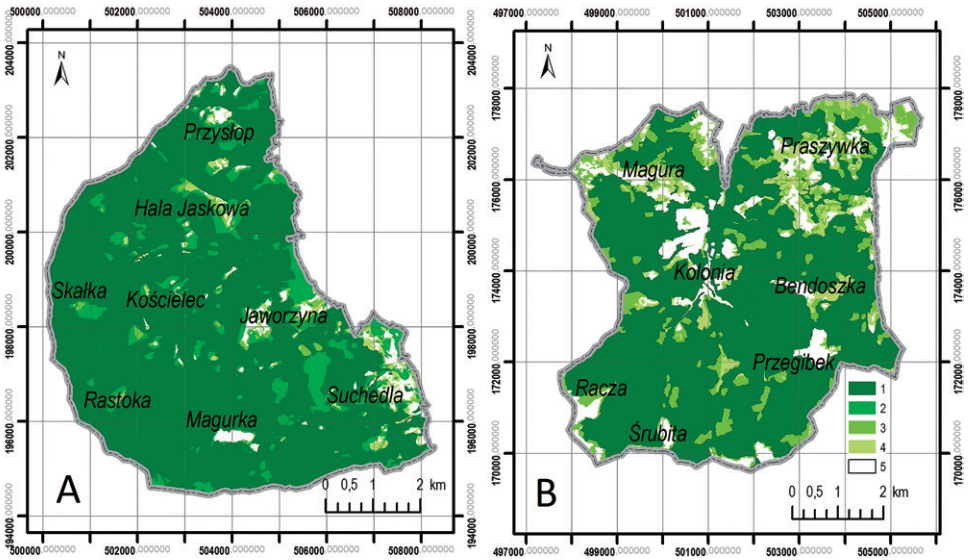

Figure 2. The changes in the extent of non-forest patches between 1848-2014: A – the Wiślańskie mountain range. Explanation: 1 – forest extent in 1848; regression of non-forest patch extent in years: 2 – 1848-1960, 3 – 1960-1979, 4 – 1979-2014; 5 – non-forest patch extent in 2014; B – the Raczańskie mountain range. Explanation: 1 – forest extent in 1848; regression of non-forest patch extent in years: 2 – 1848-1975, 3 – 1975-1979, 4 – 1979-2014; 5 – non-forest patch extent in 2014

- Stage 1 – the end of the 15th century – the 17th century – landscape formed only by mountain grazing. The genesis of the pasture landscapes in the Carpathians is connected with the migration of the Vlach population which took place in Polish territories from the 14th to the turn of the 16th and 17th centuries. This population engaged in sheep grazing (Jawor 2000). During this stage, the pasture landscape of the Silesian and Żywiec Beskid ranges took the form of semi-natural non-forest plant communities patches located within the forest matrix. The process of landscape opening occurred because of encompassing further areas for grazing from the end of the 15th century. Wooden farm buildings on mountain pastures were landmarks.
- Stage 2 – the 17th century – the mid-19th century – 'the golden period' of mountain grazing, settlement on the undermost glades (expansion of the buildings and arable fields). Until the mid-19th century the storey systems of landscape use were formed because of rapid population growth:
  - lower storey – so-called 'spodki' (meadows and pastures) and glades (meadows, pastures, arable fields and residential buildings)
  - upper storey – so-called 'hale' (mountain pastures).
- Stage 3 – mid-19th century – First World War – mountain grazing collapse as a result of forest management intensification and further expansion of built-up areas and arable lands. The mountain grazing had been declining since the mid-19th century because of social-economic changes, e.g.: industrial development, intensification of forest management, abolition of serfdom, sheep products conjuncture (Sawicki 1919; Kubijowicz 1927; Kawecki 1939). Since then, the surface of mountain pastures and glades has decreased (Fig. 2; Tab. 1, 2).

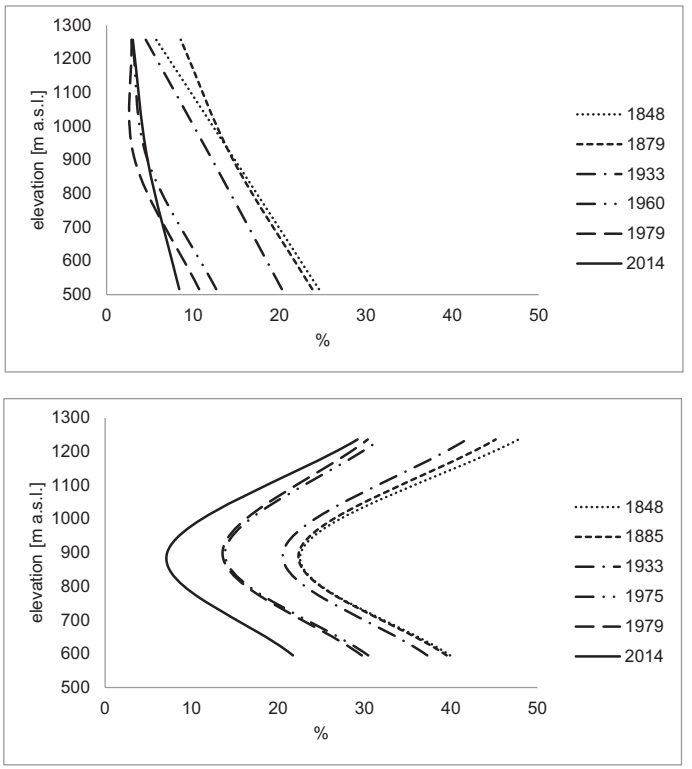

Figure 3. The changes in the extent of non-forest patches in height intervals in 1848-2014: A – the Wiślańskie mountain range, B – the Raczańskie mountain range

- Stage 4 – Inter-War Period – relative stability of mountain grazing; the beginnings of tourism development. Mountain hostels were built on the uppermost mountain pastures after the First World War and the viewing points on the pastures became touristic destinations (Sobala 2016).
- Stage 5 – 1945 – 1980/1990s – further mountain grazing collapse. The process of closing the landscape occurred as a result of secondary succession and intentional reforestation. Abandoned huts were destroyed (Fig. 5).
- Stage 6 – 1990s – the beginning of the 21st century – a lack of mountain grazing – progressive secondary succession of forestry vegetation on formerly used lands (Fig. 6). The process of closing the pasture landscape picked up pace in 1990s, which was characteristic of the territory of Poland (Plit & Myga-Piątek 2014). This process was particularly pronounced in the area being studied, as a result of a complete cessation of grazing. The gradual elimination of pasture landscapes resulted in the depletion of the ecological and aesthetic-visual structure of the Beskid landscape.
- Stage 7 – since the beginning of the 21st century – restoration of mountain grazing for the purpose of conservation (Fig. 7). Nature conservation is based on extensive sheep grazing conducted within the Provincial Program of the Economic Activation and Cultural Heritage of the Beskids and Kraków-Częstochowa Upland 'Owca Plus' and the Life + program 'The conservation of the non-forest communities in the Beskids Landscape Parks' implemented by the Silesian Group of the Landscape Parks (Sobala 2014).

The functional types of landscape

The analysis of the contemporary land use in the area studied allows the demarcation of several functional types of landscape (Fig. 4). The human activity was the demarcating criterion. In the study area used forest landscapes dominate. Forest landscapes are located at higher elevations (forest belt) and include non-forest glades and pastures. On the other hand, rural landscapes are situated at lower elevations (foothill belt), and includes forest patches, like small enclaves next to water courses or on steeper slopes. The gradual disappearance of seasonal shepherding resulted in secondary succession of forest to take place onto unused pastures and clearings (post-agricultural landscapes); some of these are now completely forested and form unused forest landscapes.

Discussion

The trajectories of pasture landscape changes

The trends in land use were mainly determined by non-environmental factors. The abovementioned stages refer largely to the landscape forming stages in other Carpathians areas (Łajczak 2004; Plit 2004; Munteanu et al. 2014). However, it should be pointed that there are differences in the degree of land utilization in the areas analysed. Due to slightly different natural conditions, the land use structure was closer to the optimum in the Raczańskie mountain range than in the Wiślańskie mountain range. The latter was managed to a lesser extent than the Raczańskie mountain range. The process of secondary succession of forestry vegetation on the formerly used lands has been faster in this mountain range since the mid-19th century as a result of abandonment of pasture management in the grasslands characterised by unfavourable topographic-, soil- and climatic conditions.

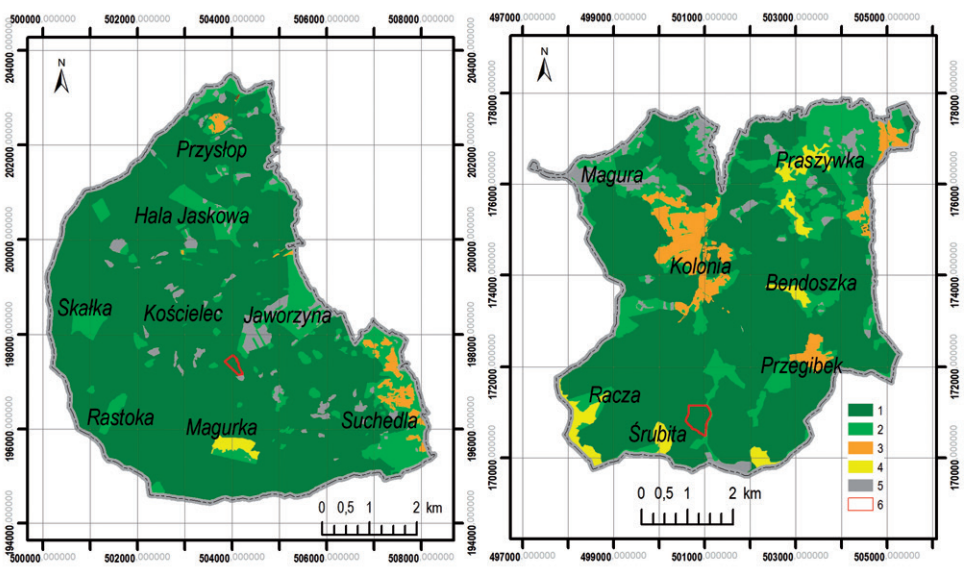

Figure 4. The functional types of landscape of the Wiślańskie mountain range (A) and the Raczańskie mountain range (B). Explanation: 1 – used forest landscape, 2 – unused forest landscape, 3 – settlement-rural landscape, 4 – pasture landscape, 5 – post-agricultural landscape, 6 – nature reserve boundary

Figure 5. Hut ruins on Praszywka Ridge in the Żywiec Beskids – 2015

Figure 6. The secondary succession of vegetation on Hala Jaskowa overgrown by *Vaccinietum myrtilli* – 2014

The changes concerning the area studied were connected until the mid-19th century with deforestation, and afterwards with reforestation. This refers to the concept of 'forest transition' typical of mountain areas all over the world (Mather 1992; Kozak 2004; Rudel et al. 2005; Meyfroidt & Lambin 2011). Although some generic processes can be identified, different regions all over the world do not necessarily experience a regular pattern of forest cover changes with time or development, and the causes and outcomes of forest transitions vary (Meyfroidt & Lambin 2011). The different processes through which forest transitions occur are contingent upon the local socio-economic and ecological contexts. In Western Europe reforestation started in the 19th century

Figure 7. Sheep grazing on Hala Radziechowska in the Silesian Beskids – effect of The "Owca Plus" programme – 2013

and was related to the industrial revolution. It developed after World War II (Mather 2001). In Central and Eastern Europe, the increase in forest areas was mainly related to socio-economic transformations in the countries of the former Eastern Bloc in the late 1990s (Gellrich et al. 2007, Bičik & Jeleček 2009, Griffiths et al. 2013). However, things happened somewhat differently in the Polish Carpathians (Kozak 2005; Wolski 2007; Munteanu et al. 2014). Deforestation took place later in comparison with the lower parts of the mountains and the valleys of larger rivers; shortage of land resources in the lower parts drove expansion onto the higher slopes. In the Beskids, reforestation started in the late 19th century when forest management intensified and locations less favourable for human activities were abandoned (Sobala et al. 2017). Local factors can modify the impact of global factors (Verburg et al. 2009). That regional diversity of changes in land use in different regions of the Carpathians evolved despite the same political- and socio-economic upheavals was demonstrated by Munteanu et al. (2014).

Pasture landscape durability factors

The majority of the former pasture landscape in the study area has evolved into forest landscapes characterised by a different degree of secondary succession progress or, to a lesser extent, into settlement landscapes, including those used for tourism purposes. The analysis of the distribution of landscape functional types as well as the conclusion of the current discussion on the future of traditional Carpathian mountain grazing allows the claim that pasture landscapes have a chance to be preserved. However, many different factors should be taken into consideration in an integrated way when planning pasture landscape optimization (Tab. 3).

During his previous research (Sobala 2015), the author proved that forestry and mountain grazing are the optimal ways of using land in the research area because of natural environmental conditions. However, the changing socio-economic conditions make it impossible to maintain pasture landscapes in their primeval form. Firstly, their extent is decreasing, which is the result of the declining importance of mountain grazing (land use changes and progressive secondary succession on uncultivated mountain

Table 3. Important factors for planning pasture landscape optimization

Factors	Description
Natural	potential and actual directions of use of natural resources and values, methods and level of optimum management of natural resources, character of ecological processes, ecological structure of landscape, ecological threats to human activities, including soil erosion, level and need for nature protection, including preservation of traditional grazing, transregional environmental relations (ecological corridors)
Historical-cultural	regional architecture, lifestyles and values, regional identity, cultural level, tradition
Social	character and method of administration by local authorities and level of social support for authorities, social participation, demographic phenomena
Economic	transition into market-oriented economy, capital resources, demand, profitability of business activities, traditional methods of management, income of residents, employment pattern, workplaces, mutual relations between regions, degree of use of resources from EU programmes
Political	strategies of action for environment related to occurrence of areas degraded as a result of improper agriculture or regions with high values requiring protection, conflicts between business, social or political objectives and those related to nature protection
Legal	current legal regulations, existing forms of landscape protection, quality of spatial planning
Technical and technological	technical and technological level, level and directions of innovation, methods of management in grazing

pastures and glades). Secondly, the changes in pasture landscapes are also connected with the abandonment of the majority of traditional wooden buildings, which are landscape landmarks in the pasture landscape. These buildings were connected directly with grazing (huts) as well as mowing (sheds).

The future development of pasture landscapes in the research area depends on several factors of a social, economic, legal and administrative nature (Tab. 4). These conditions may either stimulate mountain grazing growth or hinder it. Pasture landscape preservation will be possible by forming these factors properly.

Two categories of protected areas are significant for pasture landscape durability in the study area: landscape parks and Natura 2000 sites. The planning documents produced for these protected areas emphasize the importance of preserving extensive mountain grazing for nature conservation, highlighting that it is a necessary action to maintain the desirable state of valuable non-forest communities (Sobala et al. 2017). That attitude fits in with the concept of the multifunctionality of agriculture and makes nature and landscape conservation and also economic activity reconcilable. However, these documents relate to the elements of the biotic environment in its entirety. Nevertheless, the traditional farm buildings preserved remotely on selected mountain pastures and glades are also elements of the pasture landscape. There is no legal basis for enabling their maintenance in the landscape (Sobala 2015).

At present, extensive sheep grazing is practised primarily in mountain pastures characterised by an uppermost situation, a huge surface and a convenient location. Their choice is significantly predetermined by the current nature conservation needs – the grazed areas are particularly environmentally valuable. However, historical land use legacies affect contemporary land use as well (Monteanu et al. 2017). Reforestation is most advanced in areas of small non-forest enclaves without residential development.

Pasture landscape durability is inextricably linked with the profitability of mountain grazing. The economic realities of the modern

Table 4. Factors determining the possibility of continuing mountain grazing

Group of factors	Supportive factors	Inhibiting factors
Legal-administrative	• pasture landscape conservation in landscape parks and Natura 2000 sites, • increased interest in landscape quality – the necessity of implementing landscape audits	• restrictive law regulations concerning husbandry maladjusted to the specific mountain conditions, • no legal basis enabling traditional farm buildings to be maintained (huts and sheds), • not taking pasture landscapes into account in the planning documents, • land fragmentation which hinders obtaining approval for grazing
Economic	• implementation of programs supporting traditional mountain grazing (payments for grazing, pasture infrastructure building – huts, watering holes, pens etc.), • tourist demand for regional products	• lack of demand for sheep products (sheepskin, wool, lamb), • lack of a guarantee of the continuity of the programmes supporting traditional mountain grazing
Social	• the desire to continue traditional mountain grazing, • tourists interested in pasture culture, • importance to tourism of the scenic value of mountain pastures and glades	• low level of awareness of landscape scenic value

market economy, including globalization and opening international markets, make sheep farming and sheep production unprofitable (Musiał 2008). Properly prepared support programs are the most effective methods to support mountain areas. The Common Agricultural Policy of the European Union serves that purpose (Czekaj & Żmija 2013). Nevertheless, the regulations on breeding are still a barrier to small producers' development. Since 2004, sheep farming has required a number of conditions to be fulfilled, as a result of binding regulations adapting Polish law to EU requirements. A small producer owning a traditional farm is not able to meet the demands of the law without a considerable investment, but often without a change in mentality (Nowakowski 2008). This opinion is confirmed by local growers, according to whom the legal system does not reflect the organizational form of mountain grazing and milk processing which has been practised for hundreds of years (historical-cultural factors). In their view, land fragmentation and small farms result in pointlessness of applying for the agricultural subsidies. Meanwhile, the local communities have been cooperating with each other for years. This cooperation involves giving senior shepherds sheep for summer grazing as well as allowing them to use their private lands. In this way, clusters gathering the local communities are formed, which is the basis for the development of rural social capital (Michałek 2015).

In the era marked by the dwindling significance of sheep products, the non-productive importance of sheep farming is increasingly appreciated (Niżnikowski 2001, 2006; Czylok et al. 2010; Rokicki 2010; Bernacka et al. 2011). Thereby, outreach programmes, which include using extensive grazing in nature conservation, are indispensible actions for

maintaining deficient sheep farming (Fig. 7) (Metera et al. 2010; Sobala 2014). This solution has been used in European countries for many years (Harnett 1995; Gordon 1998; Finck et al. 2002). Not only may these programmes be treated as a support for sheep farming and nature conservations, they also enable the development of many other spheres of social activity, both of a commercial nature (traditional and regional products market, handicrafts, tourism) and a non-commercial one (landscape identity, tradition, folk culture) (Fig. 8, 9). This has particular importance for tourism based on local customs and rituals. Furthermore, open mountain pastures and glades areas have great importance for the perception of the vast mountain panorama's scenic values, thereby decreasing the sightseeing and tourism attractiveness.

Figure 8. Sheep parade in Koniaków attracts tourists interested in pasture culture – 2014

Figure 9. Articles made from sheep milk are bought readily by tourists. The Center of Regional Products in Koniaków

These programmes would not have a chance to be implemented without local communities' desire to continue the traditions associated with mountain grazing. This desire arises from a high level of regional identity and from the fact that mountain grazing is treated as the basis of local culture.

Strengthening pasture landscape conservation in the area studied, including traditional farm buildings, may be brought about by the implementing the European Landscape Convention which is the first international treaty to be exclusively devoted to all aspects of European landscape. It concerns landscapes that might be considered outstanding as well as everyday or degraded landscapes. The Convention is aimed at: the protection, management and planning of all landscapes and raising awareness of the value of a living landscape. The current legislative system has a real impact on landscape development. The efficiency of the Polish legal regulations related to landscaping concerns the dispersed nature of landscape legislation in many acts and weak implementing instruments of landscape conservation (Badora 2014; Fogel 2014, 2016; Wańkowicz 2015) as well as the lack of a systematic approach to landscape conservation and landscape policy (Myga-Piątek & Nita 2015; Solon et al. 2015).

Conclusions

The study allows the following conclusions to be drawn:

1. The declining importance of mountain grazing in the Beskid Mountains since the mid-19th century (decrease in headage, land use limitation) as well as changes in the grazing system, lead to the decrease in the extent of pasture landscapes. At present, these landscapes have a relict character and primarily cover the uppermost mountain pastures characterised by huge surfaces, a location convenient for modern grazing and a low degree of secondary succession progress.

2. The majority of the former pasture landscape has evolved into forest landscapes characterised by a different degree of secondary succession progress or, to a lesser extent, into settlement landscapes, including those used for tourism purposes.

3. The pasture landscape durability, understood as a continuity of processes and fulfilling a function for the sake of human, will be possible only if the operations supporting the traditional mountain grazing are continued. These operations will make the use of foregoing mountain pastures and glades possible.

4. The following factors are threats to the durability of traditional forms of pasture landscapes: natural and human-accelerated reforestation on unused mountain pastures and glades, the elimination of small-scale habitats (stone banks and mounds), progressive degradation of huts and the expansion of various forms of housing and infrastructure (including that for tourism).

5. Carpathian grazing is a kind of economic activity which plays an important role in maintaining the protected areas, landscaping, fostering the diversity of the natural environment, village identity, tradition, folk culture, stimulating local entrepreneurship and decreasing the tourism attractiveness of the region. Because of grazing's multifunctionality, this kind of activity has a chance to be preserved. This is reflected in existing legal-administrative actions.

Preserving the pasture landscapes in the Carpathians is possible thanks to an atmosphere conducive to traditional mountain grazing (special supporting funds, using the extensive grazing in nature conservation, increasing concern about the pasture culture among tourists as well as inhabitants) and the increased social and administrative (legal) interest in landscape quality. The activity aimed at preserving the pasture landscapes may be conducted in two ways. Firstly through preserving some values of pasture landscapes by continuing activities which contributed to the creation of those values. Thus, it is essential to maintain certain types of extensive mountain grazing and to work out successful and effective ways of public support. On the other hand, landscape durability may

be connected with introducing completely new landscape functions while being able to maintain the values existing so far. Pasture landscapes have great development potential in terms of agrotourism, ecotourism, sightseeing and ecological agriculture. Such an approach, however, requires abstaining from a strictly economic attitude (tourism commercialization and intensification of economic profits).

The necessity of formulating the model of the modern mountain grazing is still a challenge. Generating such a model would ensure the durability of the pasture landscapes in the Carpathians.

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