Traditional Agricultural Landscapes in Transition – Thoughts Regarding a Future Model for Sustainable Protection of Biodiversity in Poland

Michael Link

Tradycyjny krajobraz rolniczy w trakcie przemian – przyszłościowy model zrównoważonej ochrony bioróżnorodności na terenie Polski

After Poland became a member of the EU, the administrative conditions changed. The rural areas are experiencing a dynamic transformation from traditional land usage into a more economically based form aimed at intensifying production. This development process is, on the one hand, responsible for an increased effectiveness in production, yet, on the other hand, has a negative effect on the diversity of cultural landscapes. The change of agricultural structures in Central and Western Europe foremost affects the traditional farms in disadvantaged areas.

The increase in agricultural production intensity combined with the cessation of farming in former agricultural areas has resulted in a drastic decline in the variety of cultural landscape elements. Small-scale farmers in the peripheral regions of Poland have left farming. At the same time field sizes in regions with a high soil quality have increased.

The change in the Polish agricultural management structure should not lead to a decrease in the diversity of landscape elements and species. There is therefore a need to balance intensive agricultural production against the protection of historical cultural landscapes.

The cultural landscape in Central Europe in the course of time

During the last two centuries the Middle European landscape has significantly changed. At the beginning of the 19th century the semi-open park landscapes were characterised by thin out forests as well as heaths and pastures inside the forests. This kind of landscape structure appears to us today on old pictures as 'uncultivated', even though the landscape in former times was deeply influenced by human impact. At this time the original state of the landscape has long since vanished [Konold 1996].

Sustainable development is not an actual invention or an idea of the United Nations Conference on Environment and Development (UNCED) at Rio de Janeiro in 1992. Because of the constantly increasing demand for wood for energy, building and mining at the beginning of the industrialisation (second half of the 18th century), wood and wood products became rare. As a result, the Forest Administration began searching for a sustainable way to solve the wood shortage by limiting the removal of wood to the amount wood that could be grown during the same time [Haber 1994].

At the middle of the 19th century the species richness in Germany achieved a maximum. The reason was a country-wide dominating ex-

Huge sized economically based rationalized land usage in the eastern part of Pomerania between Toruń and Gdańsk

tensive way of land usage connected with a huge number of different vegetation and biotope types [Korneck et al. 1996].

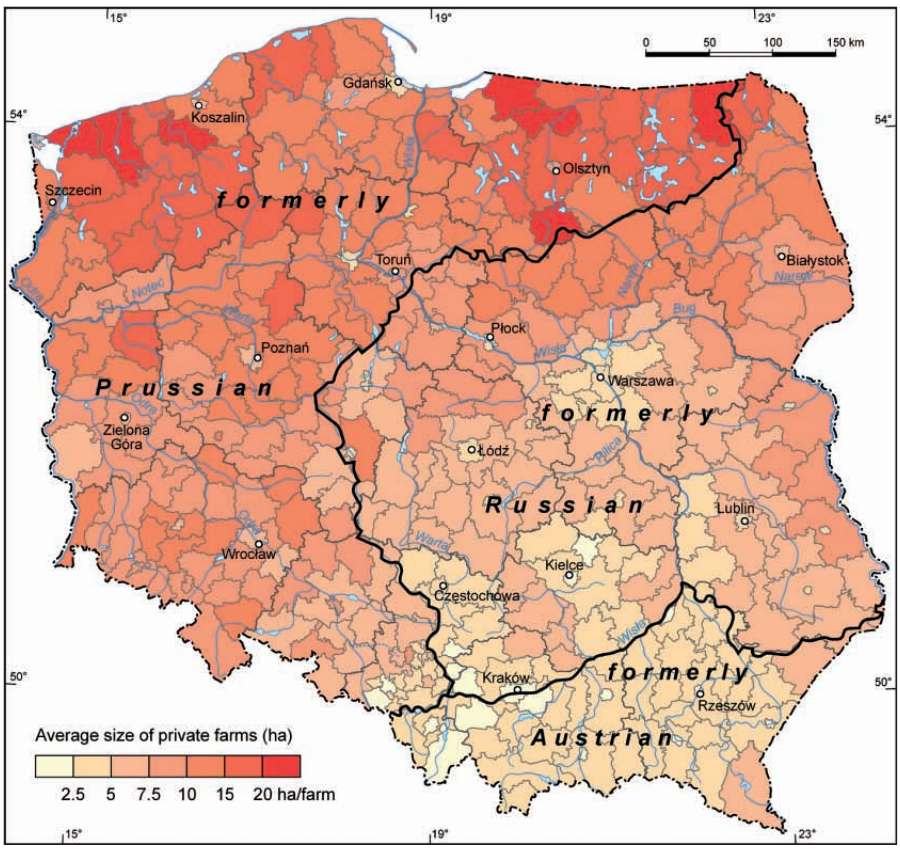
Another important break for the development of the cultural landscape was the invention of the mineral fertilisation by Justus von Liebig [Liebig 1846]. The rationalisation and intensification of agricultural land use since 1850 would not have been possible without his invention.

However it lasted about 100 years before the landscape changes became common in Central and Western Europe. Extensively used agricultural landscapes, which were rich in species and historical landscape elements, became very rare in this area after World War II.

Changes in agricultural structure (rationalisation and intensification of farming), characteristically ameliorations of soils on huge areas (⇒ levelling of site factors), simplifications of crop rotation (⇒ less number of useful plants) as well as increasing field sizes (⇒ lost of small sized structures and boundary line density inside the cultural landscape) led to a massive decrease of species. This process of degradation and devastation, as well as a loss of identification with the historical landscape character that was supported by the agricultural policy of the last 50 years, has produced huge, monotonous and only for the intensive agricultural production valuable, 'Modern Agricultural Landscapes'.

In Poland the intensive and huge sized economically based agricultural production can especially be found in the former German parts in the northern (former Pomerania, West and East Prussia) and western regions (former Lower and Upper Silesia).

The map shows a northwest to southeast aligned gradient in the average size of private farms in Poland, a gradient that reflects the Polish Division from 1795 to 1918.



Average size of private farms in Poland in relation to the historical borders from 1795 to 1918 (changed after Mydel 2001)

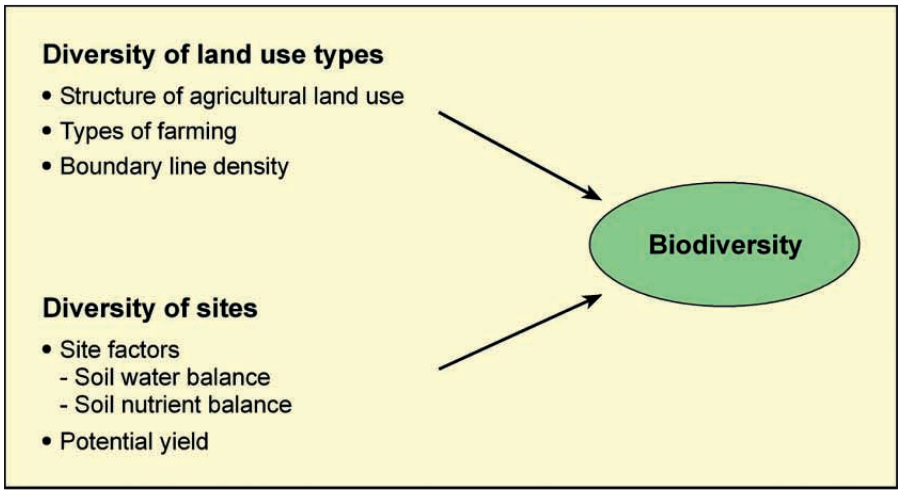
What factors are influencing the biodiversity of cultural landscapes?

The diversity of species appearing in a cultural landscape is caused by the diversity of species in the area of anthropogenic structural elements (agriculturally used areas like fields and grassland etc. as well as unused areas like ditches, hedges and baulks etc.) as well as biotopes with a high degree of naturalness (semi-natural forests, pit boxes etc.). For spatio-temporal consideration it is especially important to observe the species of anthropogenic biotopes which are strongly bounded to historical types of land usage (e.g. calcareous semi-dry meadows, 'tussock' grass lands, litter-straw meadows) [Harrach & Sauer 2002].

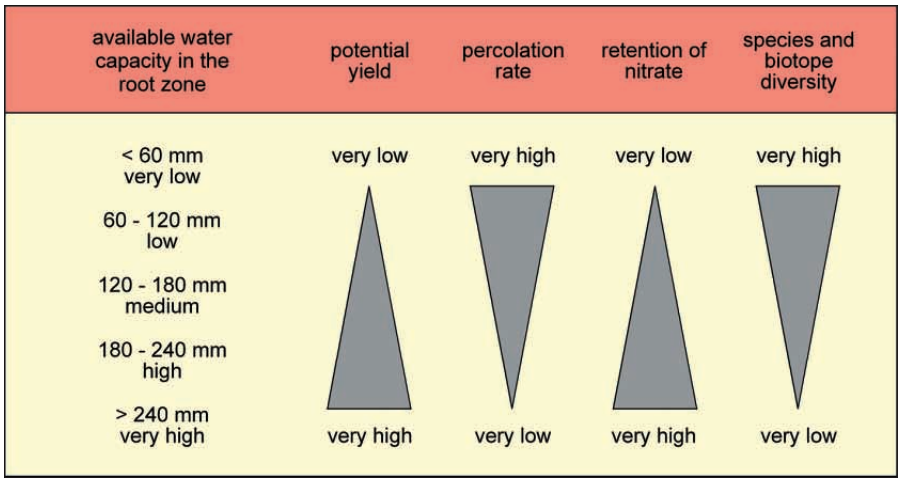
The biodiversity of typical agricultural landscapes such as those in Poland is based on the variety of sites, that is on the natural growing conditions (climate, geology, geomorphology, soils and hydrology). Soil moisture is highly influential on the variety of sites and their characteristic combination of species. A decisive parameter to classify important functions of soils is the available water capacity in the root zone. Soils with high available water capacity in the root zone and high yield potential have low values for nature conservation. In contrast, sites with low available water capacity and low yield potential are characterized by a high ecological quality [Link et al. 2007 and Link 2008].

The anthropogenic impact has to be considered as a further important factor in explaining the biodiversity of agricultural landscapes. The diversity of land use types is mainly defined by the structure of agricultural land use (e.g. field size, shape of fields) as well as the type of farming (types of agricultural production intensity). The differing density of boundary lines inside agricultural landscapes is a result of different kinds of land usage (extensive ⇒ intensive) and also very useful for analysing the diversity of land use. The biodiversity of agricultural landscapes can be understood as the result of site factors and land use affected parameters.

There is a strong connection between the biodiversity in agricultural



Controls on biodiversity in agricultural landscapes



Influence of the available water capacity in the root zone on several soil functions (after Harrach & Sauer 2002)

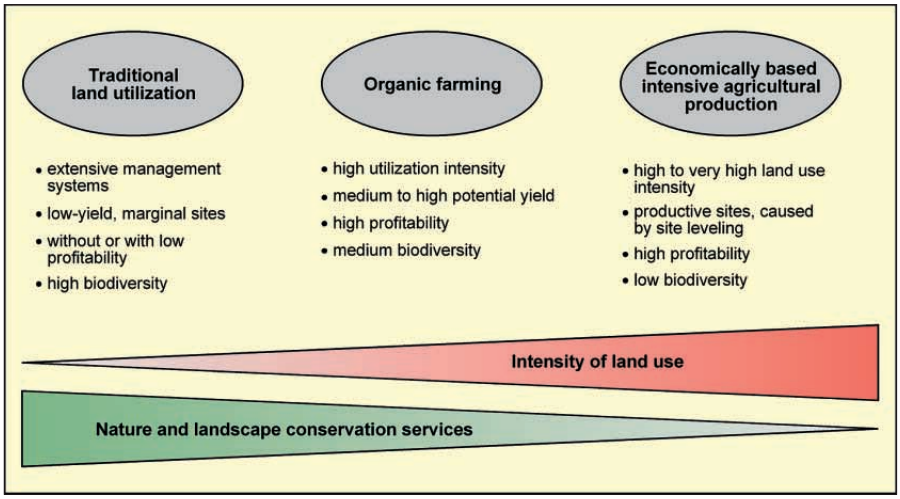
landscapes and the different types of land use. Economically based intensive agricultural farming, organic farming and traditional land utilisation represent the three main types of land usage or types of land use intensity. The economically based, intensive agricultural production is less concerned with the species and biotope protection. In contrast, traditional land utilisation, like that practiced in Poland jet, places a high value on the protection of nature and cultural landscapes [Link 2005].

The Polish traditional cultural landscape

The cultural landscape of the central and eastern as well as southern part of Poland today is still largely characterised by field patterns of narrow and long stripes as well as traditional forms of land utilisation with partly historical land usage systems.

Since Poland became a part of the EU, the dynamic of landscape development has became much faster, agricultural areas have been enlarged and the farm management has intensified. Still, there remains a mosaic of antiquated and modern types of land utilisation, which causes a high diversification of landscapes and landscape elements as well as a high to very high biological diversity. This variety is, on the one hand, threatened by intensification of land use activities and, on the other hand, by cessation of farming [Link 2004].

Influence of the three main types of farming on nature and landscape conservation services



Typical part of the Central Polish agrarian shaped landscape south from Łódź

Traditional land use with field patterns of narrow and long stripes south from Łódź

Traditionally used part of the cultural landscape of Góry Świętokrzyskie east from Kielce with a high number of transitions between arable fields and linear structures as one major factor for a distinctive high level of biological diversity

Modernised and rationalised open country sides are more or less occasional broken up by some field baulks, field tracks, linear bushes, hedge rows or tree rows. They are covering only small areas compared with the huge sized intensively used and economically based agricultural production units. Nevertheless, this thin net of linear structures between arable fields has the potential to contain double the number of species to be found on-site of the fields.

As an example, the agricultural landscape of Central Poland is characterized by a medium to high phytodiversity as a whole. As figure 12 shows, there are considerable differences in species diversity caused by the type of land usage.

On the extensively used field patterns of narrow and long stripes at the test area Bronowice (size of each test area 6.25 ha) 153 vascular plants are present. On plane biotype types there are 123 plant species, and on linear and single biotope types 100 species.

At the intensively managed, large-sized test area Popień, the picture is much different. In the entire area there are only 59 species. The relation between the number of plane biotope types (26 species) and linear biotope types (49 species) is changed. From this point of view it can be concluded that the ecological function of linear small scale structures [Link 2006] inside intensively used agricultural landscapes is very important even if they appear only

Species richness in cultural landscapes is mostly bounded to traditional land use management systems, e.g. tobacco cultivation south of Gdańsk along the river Vistula (Wisła)

Until Poland joined the EU in 2004 in the south-eastern part of Central Poland formerly typically practiced historical land use types could often be observed – nowadays hand made sheaves are gone in this region (compare with Link 2004)

on 0,8% of the whole surface as in test area Popień.

Compared with the number of species in the natural unit Łódź Hills surrounding the test areas there can be found on site of the test area Bronowice 28,6% and at Popień 11,0% of every species in this region. The differences in land use intensity between Bronowice and Popień causes a decrease of about 20% of the phytodiversity related to the whole area of the natural unit Łódź Hills.

How can the biodiversity of the agricultural landscapes in Poland be protected sustainable?

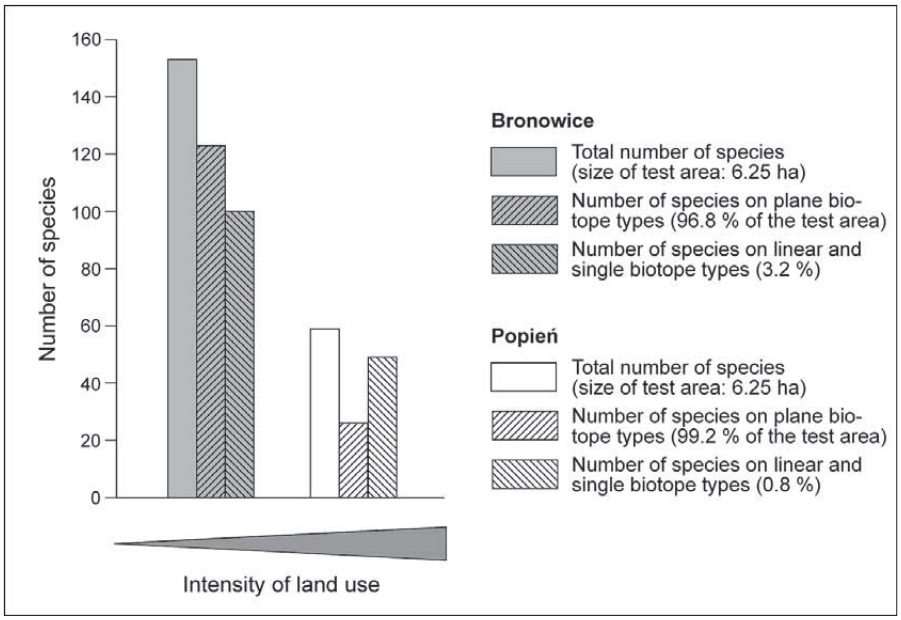
The change of the agricultural structures in Poland is in progress since the transformation into an economically orientated state with the end of socialist era. Since Poland joined the EU this process has accelerated. As has been observed in the European agricultural landscapes with a high share of economically orientated rationalized types of land usage, the change of agricultural structures provokes a massive loss of species [e.g. Barthlott, Winiger 2001 and Konold 1996]. That suggests a future decline in biodiversity in Poland.

The agricultural land utilisation in Poland is evaluated in the context of the current, mainly economically focused, discussion mostly as a 'problem'. If these 'faults' of Polish agriculture such as low productivity, low specialisation and technical backwardness are examined without considering the ecological and politico-economical consequences for the future costs of a one-sided agricultural change, there will appear the same negative consequences on the agricultural ecosystems as it can be observed in the much more rationalized western states of Europe. The decrease of biodiversity in the western states of Europe was first of all an effect of reduction of historical landscape elements and intensification of land use.

The basis for the political decisions and planning acts to protect biodiversity and historical landscape structures of Poland are mainly: (1) the site factors, (2) the structure of the elements of the historical agricultural landscape, (3) the intensity of land use as well as (4) the profitability of the land use types.

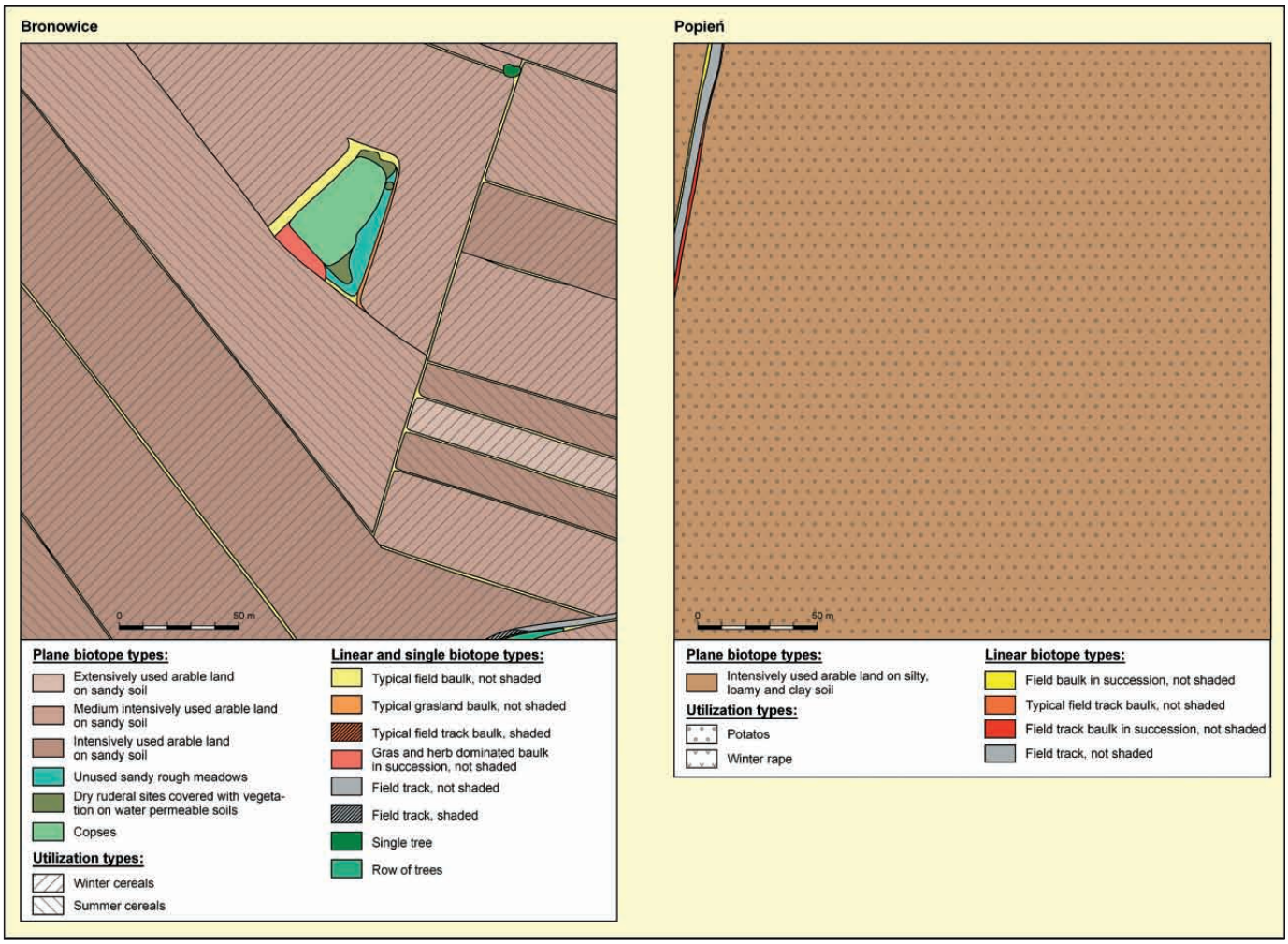
The interests of many different land users – farming, nature conservation, tourism etc. – have to be balanced in the process of planning and politically decision. For a sustainable development of the agricultural landscape in Poland it is necessary to find practicably and feasibly models and fixed goals to reach.

Medium to huge sized field patterns with linear bushes, small hedge rows, tree rows, field bulks and field tracks between, west of Wrocław (Lower Silesia)

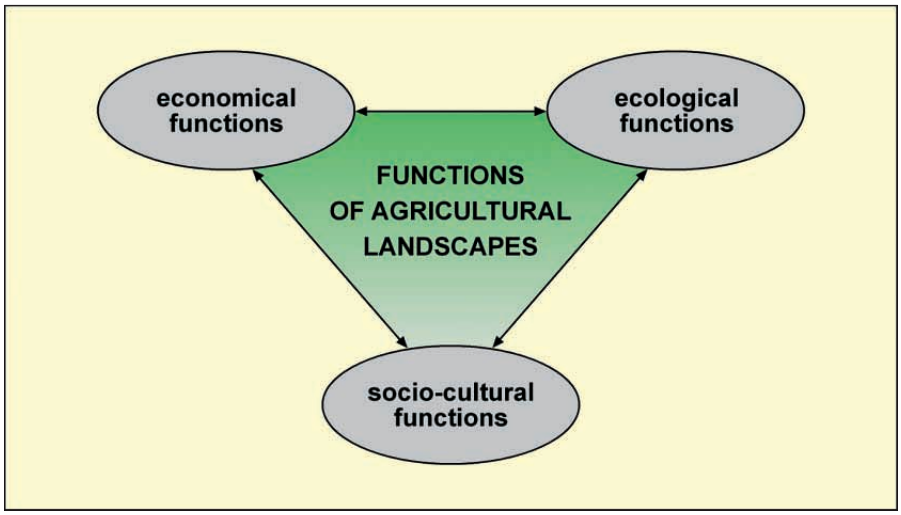


Phytodiversity of the test areas Bronowice and Popień (about 25 km east from Łódź)

Basically the dynamic development of cultural landscapes should be supported; stagnation, or the building of a museum out of historical landscapes, is counterproductive. A socio-economic base is the main condition to give the people the chance to remain inside structural weak country sides. This base can also be created within the implementation of ecological aspects into regional policy, e.g. landscape protection measurements supported and financed by the EU.



Biotope and land use type map of the test areas Bronowice and Popień



Multifunctional land use as a basis for sustainable development of cultural landscapes

The following principally aspects should be considered concerning the protection of biodiversity and historical landscape structures in the agricultural landscape of Poland:

- Sustainable nature and landscape conservation are only useful as well as possible within sustainable farming.
- Nature and landscape conservation services managed by farmers must be financially supported by the public administration.
- The intensity of land use has to be related to the site factors.

The future model for the development of the agricultural landscape in Poland recommended to be orientated according the principles of multifunctional landscapes [Brandt, Vejre 2004]. A compromise between economical, ecological and socio-cultural demands on cultural landscapes in Poland should be implemented between extensive and intensive land use options. Bronowice and Popień give an impression of the wide range inside which the sustainable development of the region east of Łódź could be realized. The next photo shows us a part of the Łódź Hill landscape, which represents an example for a multifunctional used landscape that includes as many spatial requirements as possible.

Michael Link
Uniwersytet Przyrodniczy we Wrocławiu
oraz Justus Liebig Univesität Giessen
Fakultet Naturwissenschaft
Wrocław Univesity of Environmental and Life Sciences
and Justus Liebig Univesity Giessen

References

1. Barthlott W., Winiger M. (Eds.), 2001, *Biodiversity – A Challenge for Development Research and Policy*, 2. Edition, Berlin, Heidelberg, New York.
2. Brandt J., Vejre H. (Eds.), 2004, *Multifunctional Landscapes – Vol. I*: Theory, Values and History (Advances in Ecological Sciences, Vol. 14), Southampton, Boston.
3. Haber W., 1994, *„Nachhaltigkeit" (sustainability) ein tragfähiges ökologisches Konzept?* [in:] *Pfadenhauer, J. (Hrsg.): 23*. Jahrestagung der Gesellschaft für Ökologie, Innsbruck 1993 (Verhandlungen der Gesellschaft für Ökologie, Bd. 23), Freising-Weihenstephan, s. 7-17.
4. Harrach T., Sauer St., 2002, *Zeitliche und räumliche Aspekte der Beziehung von Landwirtschaft und*

A multifunctional used part of the natural unit Łódź Hills east from Łódź which shows an example for sustainable development of agrarian shaped landscapes in Poland

Naturschutz aus bodenkundlicher Sicht, in: Akademie für die Ländlichen Räume Schleswig-Holsteins (Hrsg.), Naturschutz und Landwirtschaft – neue Überlegungen und Konzepte, Eckernförde, s. 130-148.
5. Konold W. (Hrsg.), 1996, *Naturlandschaft – Kulturlandschaft: Die Veränderung der Landschaften nach der Nutzbarmachung durch den Menschen*, Landsberg.
6. Korneck D., Schnittler M., Vollmer I., 1996, *Rote Liste der Farn- und Blütenpflanzen (Pteridophyta et Spermatophyta) Deutschlands* [in:] *Bundesamt für Naturschutz (Hrsg.): Rote Liste gefährdeter Pflanzen Deutschlands (Schriftenreihe für Vegetationskunde, H. 28),* Bonn – Bad Godesberg, s. 21-187.
7. Liebig J.,1846, *Die Chemie in ihrer Anwendung auf Agricultur und Physiologie,* 6. Auflage, Braunschweig.
8. Link M., 2004, *Die biologische Vielfalt Mittelpolens im Wandel – Lässt sich Biodiversität auch unter veränderten agrarpolitischen Bedingungen erhalten?* [in:] Spiegel der Forschung 21, H. 1/2, s. 34-41.
9. Link M., 2005, *Einflussgrößen, Zustand und Möglichkeiten der Sicherung biologischer Vielfalt in der Agrarlandschaft Mittelpolens, in: Bundesamt für Naturschutz (Hrsg.): Treffpunkt biologische Vielfalt: Aktuelle Forschung im Rahmen des Übereinkommens über die biologische Vielfalt, vorgestellt auf einer wissenschaftlichen Expertentagung an der Internationalen Naturschutzakademie Insel Vilm vom 23-27.* August 2004 (Treffpunkt biologische Vielfalt, Bd. 5), Bonn – Bad Godesberg, s. 137-143.
10. Link M., 2006, *Funktionen gras- und krautdominierter linearer Strukturelemente in der Kulturlandschaft und deren Bedeutung für den Arten- und Biotopschutz, in: Büchs W. (red.): Möglichkeiten und Grenzen der Ökologisierung der Landwirtschaft – wissenschaftliche Grundlagen und praktische Erfahrungen – Beiträge aus dem Arbeitskreis „Agrarökologie" (Mitteilungen aus der Biologischen Bundesanstalt für Land- und Forstwirtschaft, Bd. 403),* Berlin – Dahlem, s. 125-135.
11. Link M., 2008, *Die ökologische Interpretation polnischer Bodenschätzungsdaten – Praktische Umsetzbarkeit und potenzielle Einsatzgebiete* [in:] *Berichte der Deutschen Bodenkundlichen Gesellschaft, Online-Publikation:* <http://www.dbges.de/wb/ media/bdbg/treffenweimar08/DBG_2008_Beitrag_15.pdf>), s. 4.
12. Link, M., Kowalkowski A., Niewiadomski A., Harrach T., 2007, *Die polnische Bodenschätzung und Möglichkeiten der ökologischen Interpretation ihrer Ergebnisse,* in: Mitteilungen der Deutschen Bodenkundlichen Gesellschaft, 110, H. 2, s. 571-572.
13. Mydel, R. (red.),2001, *Atlas Polski – Tom 1: Przyroda – Społeczeństwo – Gospodarka*, Kraków.

Summaries

Problems

The Principle of Balanced Development in Landscape Architecture (Legal Aspects of The Issue)

The article contains a discussion on theoretical concepts and definitions of balanced development and landscape, occurring in the commonly obligatory legal rules

The constitutional basis for landscape protection have been pointed out, with particular consideration for the concept of balanced development as a principle shaping the landscape.

The author also concentrated on indicating the factors shaping landscape, based on the obligatory legal rules in the sphere of environment protection, and made an attempt at evaluating the influence of the above factors on rational shaping of landscape and mutual conditioning between the effective protection of the environment, rational landscape configuration and the principle of balanced development.

The analysis conducted by the author and the interpretation of the legal rules provides for solutions accepted on the national and international levels. The author's considerations take into account law courts' decisions as well as literature and views of the doctrine in the range of the subject.

Marcin Sobota

Market Squares of Small Towns and Villages Having Urban Traditions as Valuable Landscape Interiors

At Lower Silesia many small towns and villages which formerly had civic laws are to be found, but in the course of time they lost them. The considered settlements date back mostly to 13th century, they often went through severe trials, e.g. wars, fires, or floods. They obtained the civic laws as a result of a number of factors, then often they lost them, or sometimes recovered them again. The main elements of small towns are the market square and streets coming out of it. The frontages of the market square mostly have a compact building, often, even in small towns a town hall is to be found in the centre of a market square. The settlements in the piedmont terrains are especially picturesque, the market square forms there an interesting landscape interior. In the conclusion there is pointed out that systems of small towns and villages having urban traditions require a suitable space planning and a conservator's protection.

Zuzanna Borcz

Traditional Agricultural Landscapes in Transition – Thoughts Regarding a Future Model for Sustainable Protection of Biodiversity in Poland

This paper deals with the basic aspects of the far-reaching changes in the agricultural landscapes of Central Europe over the course of time, and specifically with the impact on biodiversity brought about by the transformation process after Poland became a member of the EU.

The main controls on biodiversity in agricultural landscapes are the diversity of land use types (structure of agricultural land use, types of farming, boundary line density) and the diversity of sites (soil nutrient and water balance, potential yield). The agricultural landscape of Poland is characterized by a medium to high phytodiversity on huge areas. There are considerable differences in spe-

cies diversity caused by the type of land use.

The basis for the political decisions and planning acts to protect biodiversity and historical landscape structures of Poland are mainly: (1) the site factors, (2) the structure of the elements of the historical agricultural landscape, (3) the intensity of land use as well as (4) the profitability of the land use types. The following principal aspects should be considered concerning the protection of biodiversity and historical landscape structures in the agricultural landscape of Poland: (1) sustainable nature and landscape conservation are only useful as well as possible within sustainable farming, (2) nature and landscape conservation services managed by farmers must be financially supported by the public administration and (3) the intensity of land use has to be related to the site factors.

Michael Link

Presentations

Natural Aspects of Location of Small Water Retention Objects, an Example of Arid Alder Forests

Problems with situating objects of small retention in forest areas – also those included in the network of areas of exceptional protection "NATURE 2000" was discussed in the article. Issues were discussed taking Włoszczowa Forest Inspectorate, Swiętokrzyskie Voivodeship into consideration, where part of the area was particularly arid, among others, as a result of former intensive dehydrating meliorations.

Piotr Krzyk

Identity of a Place – the Example of „Dolina Baryczy" Landscape Park

In the article attention has been paid to the identity of a place understood as sentimental attachment of the inhabitants to their dwelling place, the sense of bonds and responsibility for organization, maintenance and utilization of the place. Every place has its own distinct, specific character, and is exceptional for those users who feel good there because they create the place together and are responsible for it. Attention has also been paid to transformation of spatial management and landscape, which can bring about the loss of the identity of the place, shaped throughout decades.

The valuable components of the extremely precious landscape of the Barycz valley have been pointed out, and directives of shaping new building as well as modernization of the already existing one have been formulated. The research area was constituted by localities situated within the range of "Dolina Baryczy" Landscape Park.

Beata Warczewska

Recalling the Forgotten Arcadia – the Residential Gardens of Kłodzko County

The present article attempts to reveal the meaning of the residential gardens of the former Kłodzko county, presently lost and forgotten, in order to shape their unique *image*. The compositional features of these gardens as well as the metaphoric and symbolic contents enclosed in them are a reflection of styles and fashions of the epochs in which they were created and later evolved.

Nr 4/2008

Zachowanie różnorodności krajobrazu

Protection of Landscape Diversity